MASTER'S THESIS

Competences of sustainability professionals, and competence bottlenecks for change towards environmental sustainable behaviour

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Competences of sustainability professionals, and competence bottlenecks for change towards environmental sustainable behaviour

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Content

Summary

The Intergovernmental Panel on Climate Change Special report (IPPC, 2018) claims for urgent action. Citizens should be prepared and motivated for change towards environmental sustainable behaviour. To prevent further climate change and loss of biodiversity, sustainability professionals, including functionaries and teachers, try to motivate citizens for change towards environmental sustainable behaviour. To succeed in driving a lasting, sustainable change process, certain competences are required. In previous research**, c**ompetences of sustainability professionals were mapped principally in function of educational programs and management. Here the focus lays on competences and competence-bottlenecks, as experienced by successful senior functionaries in Belgian Flanders. Successful means that these sustainability professionals achieved identified change processes, affecting politicians, citizens and the audience of secondary school communities to adopt an environmental sustainable lifestyle. Exploring both the practiced competences and the encountered bottlenecks for change, with these successful senior professionals, has to reveal the required competences to succeed in driving the aimed change process towards environmental sustainable behaviour.

The novelty of this qualitative research lays in the mapping of both the practiced competences of successful sustainability professionals, and emerging competence-bottlenecks for change, in relation to real-life experiences of senior functionaries dealing with sustainability in Belgian Flanders. Through a participative action research, consisting of a workshop and interviews, the practiced competences of successful sustainability professionals are explored by considering their consequential validity in relation to identified successful cases. Using triangulation for the selection of participants, the gathering of data and the applied methods, has enhanced the validity of the identification of the found competences.

The identified competences, and competence-bottlenecks for change, reveal new insight in the required competences for both the functionaries and the target audience. To **e**nable a lasting, self-steering change process, the sustainability professionals require a cluster of six overlapping competences, which we have labelled as: ‘Collaborative people & team management’, ‘Complex environmental problem-solving project management’, ‘Responsible decision making & action, ‘Analytical evaluation & adjusting’, iteratively interacting with ‘Transparent communication’ and the competence to ‘Enable key competences to germinate within the target audience’. An additional result provides the interpretation of the competences to be acquired by the target audience, to make change possible. These are correlated to characteristics of the required competences of the professionals: inquisitiveness, system thinking, responsibility, and critical analysis of choices. This represents a significant advance on previous conceptualisations of the competences required by sustainability professionals, as found through literature review.

The knowledge can be useful to speed up change processes towards environmental sustainable behaviour within society. Further research is recommended on how to learn and practice the resulting cluster of competences. Comparative research of practiced competences by successful sustainability functionaries in other European regions encountering similar bottlenecks, might confirm or modify the view on the resulting competence cluster.

Samenvatting

Het Intergovernmental Panel on Climate Change Special report (IPPC, 2018) benadrukt de urgentie om burgers voor te bereiden en te motiveren voor duurzame gedragsverandering. Om verdere klimaatverandering en verlies aan biodiversiteit te voorkomen, organiseren ambtenaren met een milieusensibiliserende functie, waaronder ook leerkrachten, allerlei projecten om mensen aan te zetten tot duurzaam gedrag. Om dit veranderingsproces te kunnen realiseren, zijn bepaalde competenties vereist. De competenties van milieuprofessionals werden wereldwijd vooral in kaart gebracht in functie van onderwijs en management. In dit onderzoek ligt de focus op zowel de competenties als de competentie-knelpunten, zoals ervaren door succesvolle Vlaamse senior

ambtenaren. Succesvolle ambtenaren hebben geïdentificeerde veranderingsprocessen gerealiseerd, waarbij politici, burgers, alsook het publiek van middelbare scholen, een ecologisch duurzame levensstijl effectief aannemen. Onderzoek naar de competenties die werden ingezet door deze succesvolle senior ambtenaren, én de knelpunten voor verandering die ze hierbij ervaren, moet de vereiste competenties achterhalen om een effectief proces van duurzame gedragsverandering te kunnen aansturen in Vlaanderen.
Het vernieuwend aspect van dit kwalitatief onderzoek ligt in het in kaart brengen van de uitgeoefende competenties én de ervaren knelpunten, in relatie tot individuele ervaringen van succesvolle senior ambtenaren. Door middel van een participatief actie-onderzoek, met een workshop en interviews, worden de nodige competenties geëxploreerd door hun consequentiële validiteit te beschouwen in relatie tot geïdentificeerde succescasussen. Triangulatie bij zowel de selectie van participanten, het verzamelen van gegevens als het toepassen van methodes, verhoogt de validiteit van de resulterende competenties.
De resulterende competenties, en competentie-knelpunten voor verandering, brengen nieuw inzicht in de vereiste competenties van zowel de ambtenaren als hun doelpubliek. Om een blijvende, zelf-sturende gedragsverandering te verwezenlijken dient de ambtenaar een cluster van zes overlappende competenties te ontwikkelen, welke we als volgt benoemen: ‘Collaboratief people & team management’, ‘Complex milieuprobleem-oplossend project management’, ‘Verantwoorde beslissingen nemen & actie odernemen’, ‘Analitisch evalueren & bijsturen’, in iteratieve interactie met ‘Transparante communicatie’ en de competencie om ‘Kerncompetences te laten ontkiemen binnen het doelpubliek’. Een extra resultaat geeft een invulling van de nodige basiscompetenties bij het doelpubliek om verandering mogelijk te maken. Deze staan in relatie tot enkele eigenschappen van competenties die we terugvinden bij de professionals: leergierigheid, systeemdenken, verantwoordelijkheidszin en kritische analyse van keuzes. Dit inzicht opent een nieuw perspectief ten opzichte van eerdere conceptualisaties van de vereiste competenties voor milieuprofessionals die we vonden in de literatuur.
De nieuwe kennis kan nuttig zijn om het duurzaam veranderingsproces te versnellen. Verder onderzoek is aanbevolen naar hoe we de resulterende competenties kunnen laten aanleren en toepassen. Vergelijkend onderzoek op competenties van succesvolle milieuprofessionals in andere Europese regios met gelijkaardige knelpunten voor verandering, kan de interpretatie van de resulterende competentiecluster bevestigen of wijzigen.

1. Introduction

Since the publication of the Bruntland report (WECD, 1987), the terms “sustainable” and “sustainable community” appear in many policy documents. A sustainable community respects the importance of the ecological environment, preserving the life-supporting systems of our planet, and tries to improve the quality of life without compromising the ability of future generations fulfilling their needs.

‘Sustainable development’ emerged in the early 1980s, and ‘sustainable science’ subsequently started in 2001 from scientific perspectives on the relation between nature and society (Kates et. al, 2001). It includes the interweaving of three pillars: environment, society and economy (van de Kruijs, 2017). The United Nations Educational, Scientific and Cultural Organization (UNESCO, 2017) published a framework of 17 sustainable development goals (SDGs) related to competences and education. The SDGs cover social, environmental and economic development issues from the 2030 Agenda for Sustainable Development, including poverty, hunger, health, education, climate change, gender equality, water, sanitation, energy, urbanization, environment and social justice. This study focusses on the SDG concerning the care of the environment, in relation to education. Within the SDGs, education is both a goal in itself (SDG4) and a key enabler for all the other SDGs (UNESCO, 2017).

2. Problem definition, research relevance and aim

2.1. Problem definition and demarcation

The special report of the Intergovernmental Panel on Climate Change (IPCC, 2018) has highlighted that 1.5℃ of warming above pre-industrial levels could have catastrophic consequences for millions around the world. The report also claims the problem of decreasing biodiversity. The change process towards sustainable behaviour has to speed up: without urgent action, we could reach that milestone in just 12 years!

According to Barth, Godemann, Rieckmann and Stoltenberg (2007), sustainable development starts with the modernisation of society, and this is only possible if the average citizen can accept, support and participate in the necessary change processes. To initiate this change process, governments, NGOs as well as industrial innovation enterprises recruit educated sustainability professionals. However, these professionals still face quite often difficulties in realizing an environmental sustainable change process within society, due to the complexity of the change process, the diversity of stakeholders and their values (Willard et al., 2011). To overcome these difficulties, specific competences have to be acquired (Wiek, Withycombe and Redman, 2011; Barth et al., 2007). In this study we explore the competences, and the experienced bottlenecks, for realising a change process towards sustainable behaviour, together with a group of sustainability professionals from Belgian Flanders.

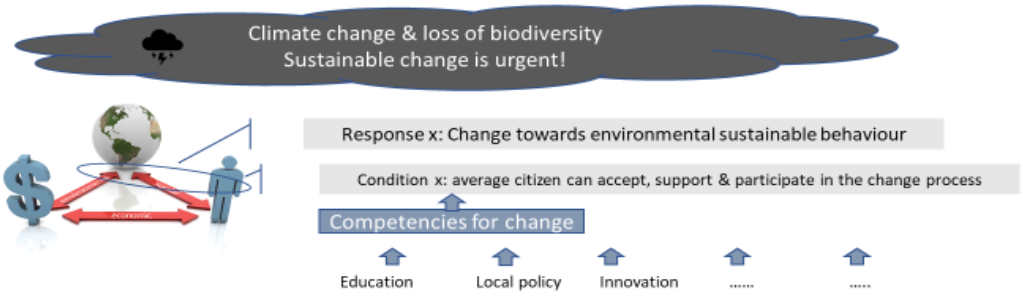

Figure 1: Problem demarcation

According to the broad definition of sustainability, sustainability professionals can be experts in sustainable economy as well as professionals in health care or urban planning. For this study, the professionals are defined and demarked as “environmental” sustainability functionaries dealing with education and sensitization, with responsibility for change towards environmental sustainable behaviour in the Belgian Flanders society.

Environmental functionaries form a special category of sustainability professionals: they’re close to politics and they can use certain forcing tools such as legislation and fines in an attempt to enhance change (they are rather independent of their “clients”).However, despite these tools, the intended change process towards sustainable behaviour seems difficult to achieve within society.

2.1.1. Environmental sustainability (demarcation of sustainability)

This study explores the required competences to improve a respectful and sustainable relationship between citizens and the natural ecological environment. The focus lays on “environmental sustainability”, which, according to Morelli (2011), can be defined as “meeting human needs without compromising the health of ecosystems”. The term “Environmental” is always associated with human interaction and its impact on ecological systems.

2.1.2. Environmental sustainability functionaries with sensitization responsibility

The duality of these environmental functionaries lays in the fact that they have to protect the health of ecosystems, linked to environmental sciences, while respecting the needs of improving the quality of human life, linked to society and economy. Environmental sustainability functionaries certainly require knowledge of environmental problems and technical skills in the field, but they also require different competences to respond to the complexity of actors and factors that will influence the behaviours and decisions of their target group (Barth et al., 2007). Although this certainly applies to environmental professionals in general (sustainability consultants, innovation managers, ...), this research focusses on experienced functionaries, who are employed by authorities as sustainability professionals with an environmental sustainability sensitizing function, and geographically demarcated to the situation in Belgian Flanders.

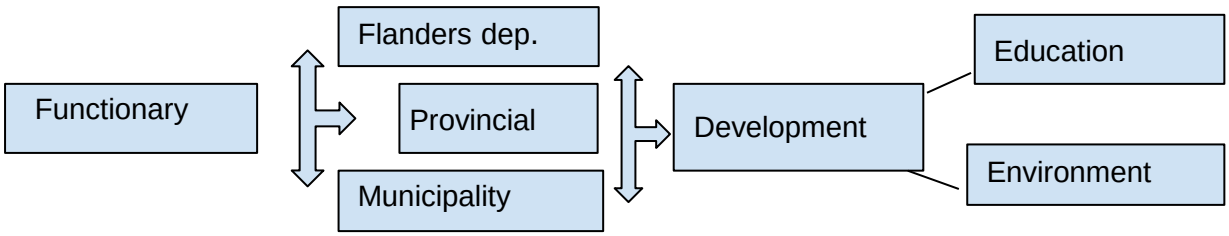

Figure 2: Localisation of the concept “functionary employed as environmental professional” at the authorities of the public domain in Belgian Flanders.

These professionals can be functionaries of the pedagogical counselling service, functionaries of the Flemish Ministry of Education and provincial functionaries dealing with environmental education programs such as MOS (Environmental care at School) or other environmental sustainability promoting programs, functionaries employed by the Agency for nature and forestry and municipal environmental sustainability functionaries, dealing with sensitization campaigns within their territory, as well as teachers with a specific environmental education attainment in secondary schools.

The principal tasks of these functionaries, working as environmental professionals, have to lead to a change process towards environmental sustainable behaviour: for example an evolution to more

sustainable policy decisions (Runhaar, Driessen & Vermeulen, 2006) or applying better eco-technologies in government contracts. Their targeted change process is situated both at the government level which they advise (politicians), as well as colleagues, citizens, companies, industries and school communities. To succeed in the intended process of behaviour change within society, they have to deal with many factors on social, societal, economic, cultural or political scale, taking into account the complexity of the change process, the diversity of their target group and their values (Willard et al., 2001). Yet some sustainability functionaries do succeed in driving a sustainable change process, even to difficult target groups. In the 1990s in Flanders for example, municipal environmental functionaries were able to convince local politicians and their citizens to start sorting their waste and bring it to recycling parks, to start using solar energy, to study ecology to become a nature guide, to support nature developing plans to increase the biodiversity, or to investigate in wastewater purifying systems.

A range of actors and factors can lead to such a change process, but those pilot sustainability professionals are especially trained by multiple actors throughout their career, to tackle some bottlenecks for change among both citizens and politicians. That's why for this study, the required competences, and the experienced bottlenecks for change, are explored with senior environmental sustainability functionaries that achieved identified change processes, affecting citizens to adopt an environmental sustainable lifestyle.

2.1.3. Competences for change

Creating the support to change habits and start acting in an environmentally sustainable way, requires the environmental sustainability functionary to have clearly further knowledge and skills than those required for single informative or educational aspects to their target group. The attitudes towards which they approach their target group are also very decisive in this context (Barth et. al, 2007).

Where integrated knowledge domains, skills and attitudes are necessary to practice in a certain context or with a specific aim, the term "competence" is commonly used in both scientific literature and by practitioners themselves (Perez Salgado, Abbott & Wilson, 2018). A competence can be observed and perceived. Competences are acquired gradually, and the different grades in the acquired competences can be measured (CVO-VIVO & IVES, 2014).

Figure 3: The concept of competences in this study

Stoof, Martens, van Merriënboer & Bastiaens (2002) consider that the concept of a competence can be explored by analysing its dimensions, taking account its differences and boundaries with related terms such as skills, attitudes and knowledge for example. The interest in "competence" rather than skills is based on the need for flexible descriptions of what should be learned to succeed in a certain context (Mochizuki & Fadeeva, 2010; Vincent & Focht, 2008). Competences integrate different kinds of knowledge, skills, values and attitudes in a transboundary adaptable mix, incorporating the ability to meet complex demands in a particular context (Lambrechts, Mulà, Ceulemans, Molderez & Gaeremynck, 2013). This boundary approach of competences means that the competences have to be explored and valued in accordance with their viability, or their success in a certain context (Stoof et al., 2002). In this study the competences are explored and valued in accordance with their specific ability to drive a change process towards environmental sustainable awareness and behaviour with respect for the natural ecological systems (goal), within the target audiences of Belgian Flanders' sustainability functionaries, related to secondary school communities (context).

This study explores the transboundary components of competences practiced by experienced senior professionals who succeed in motivating the local citizens or politicians for intervention towards environmental sustainable behaviour within their local society, and especially to their target group of secondary school communities, despite several difficulties they faced. Scientists nowadays acknowledge that knowledge production about competences for sustainability practitioners has to be process oriented with interaction between science and society (Perez Salgado et al., 2018).

2.1.4. Change process towards environmental sustainable behaviour

According to the Diffusion Theory (Rogers, 2003), innovative projects are accepted by society and applied according to an S-curve: first we have the leaders, then a few forerunners that we do not have to sensitize so much, then we get the first followers by further action, and only later we reach the big mass of late followers. Finally, there are also people who will probably never cooperate, called “the laggards”. This study explores the competences practiced by pioneer sustainability professionals, which led to successful lasting change processes, with a significant number of late followers in Belgian Flanders. Since it might take at least 10 years before the late followers change their behaviour in a significant way, senior professionals are defined as having about 20 to 30 years of experience in sensitization projects.

A change process towards environmentally positive behaviour is here defined as a lasting, sustainable behaviourial change within the target group, whereby people start being aware of the consequences of their behaviour towards the ecological environment, and therefore deliberately try to change some of their habitual acts to reduce their impact and behave with respect for the environment. Deliberately choosing means not passive under pressure of city laws, but in the freedom of daily life and further career of those involved, thanks to acquiring new insights, skills, attitudes and increased motivation to avoid harming the ecological environment. Kollmuss & Agyeman (2002) call it “pro-environmental behaviour”, for example consciously seeking to minimize resource and energy consumption, use of non-toxic substances and waste production, or to consume sustainable food.

The literature review delivers several models and hypotheses trying to explain which combinations of actors and factors can contribute to a positive or negative sustainable behaviour change. Kollmuss & Agyeman (2002) describe in "Mind the GAP: why do people act environmentally and what are the barriers to pro-environmental behaviour ?” several factors which are responsible for whether or not a campaign succeeds in a complex context. These factors are for example culture, habits, or financial aspect. Which competences do successful environmental sustainability functionaries apply to use these factors or at least take them into account ?

In addition, this study also explores the bottlenecks affecting the purpose of change towards environmental sustainability. Detecting which determining conditions for change are missing, is necessary to find which corresponding competences the supporting professionals have to practice to tackle these bottlenecks. The exploration of competences to tackle bottlenecks for change is here demarcated to those related to the target audience of secondary school communities.

2.1.5. Bottlenecks for change related to the target group of secondary school communities in Belgian Flanders

Reasoning and acting in terms of environmental sustainability is a task for everyone, just as economic thinking and acting is a general principle that should be applied in almost every profession and household. Average citizens first have to get motivated towards care to the environment and environmental sustainable behaviour during their primary and secondary school trajectory, later through further sensitization campaigns. Only a minority of them will continue through higher education.

According to Vega-Marcote, Varela-Losada & Alvarez-Suarez (2015, p 2603) “it is necessary to refocus our education, and environmental education in particular, in order to make our citizens

competent in making responsible decisions and to act in terms of sustainable development". There is also a need for teachers who can help their students participate in the processes of positive sustainable change in society (Mochizuki &Fadeeva, 2010). Our future politicians, entrepreneurs, craftsmen, colleagues, managers and average citizens are now going through their secondary school, and plenty of them won't practice further studies (Girault & Sauvé, 2008). Brundiers, Wiek & Redman (2010) claim the paradoxical situation of teachers being responsible for training students in areas of sustainability in which they themselves have never been trained.

Girault & Sauvé (2008) emphasize the fact that since the beginning of the awareness for environmental sustainability in the early 1970s, there is still no coherent cross-course educational program to environmental sustainability for secondary education included in national curricula in France and Québec. The situation has even deteriorated in comparison to the situation of the 1990s, when environmental sustainability was a hot item in the society of western countries. According to their study, todays educational programs should have to contribute to socio-ecological, philosophical, ethical and complex interdisciplinary skills, enlarging the boundaries of the science-based environmental education.

These arguments emphasize the relevance for an in-depth exploration on the required competences to tackle the bottlenecks for change towards environmental sustainable behaviour through functionaries working with in, or with (vocational and general) secondary school communities. The secondary school community refers to the target audience of pupils (12 to 18 years old), teachers (higher educated or experienced craftsmen), directors and other staff, such as caterers and accountants for example.

Local secondary school communities are a kind of miniature community, forming the future generation of our society, as well as the present one. Competence-bottlenecks for change within society might be reflected within this target group, or competences to tackle these bottlenecks might find some roots there. For this reason forelaying study also explores which competences environmental sustainability functionaries have to practice, to tackle the bottlenecks for change in the demarcated context of local secondary school communities in Belgian Flanders, especially where change is not evidenced, where even the basic sorting of rubbish is still a challenge after two decades of sensitization actions for example.

2.2. Research Relevance

The overarching competence framework for sustainability of Wiek, Withycombe and Redman (2011) argues the necessity of conceptually bound clusters of competences for sustainability professionals. They specify the competence gap between project managers with regards to sustainability and suggest key competences for use in Academic Program Development. Nowadays bachelor, master or additional training programs, coaching new experts in environmental sciences, need empirical exploration and defining of competences to succeed in achieving a social change process towards environmental sustainable behaviour (Ohman, 2011; Mochizuki & Fadeeva, 2010). Several scientific studies refer to competence-oriented education programs for graduate, bachelor and university students in countries such as Germany (Barth et al., 2007), the Netherlands (Lambrechts et. al, 2013; Perez Salgado, De Kraker, Van der Klink & Boon, 2012), Sweden (Ohman, 2011), Spain (Vega-Marcote et. al 2015), Japan (Mochizuki & Fadeeva, 2010), United Kingdom (Harvey & Norman, 2007) and Central or North American states (Flint, 2015; Remington-Doucette, Connell, Armstrong & Musgrove, 2012). Mogensen & Schnack (2010) explored the relationship between the Danish action competence approach, applied since the 1980s, and recent discourses of education for sustainable development to early adolescents. Other studies, such as Rogers (2003), Vincent & Focht (2008) and Gonsalez-Marcos, Alba-Elias & Ordierez-Meré (2015) imply the necessary competences to bring innovative products to the market, in the context of sustainable product development, management and marketing, describing general professional recruitment profiles for these relatively new

professions linked to sustainability. However, these studies are not specifically related to competences of sustainability functionaries, having important sensitization and intervention tasks towards a less or unmotivated target group, nor to the audience of Belgian Flanders' secondary school communities.

Willard et. al (2011) mention the recommendation that it could advance the sustainable change process to map the competences of individual successful sustainability professionals. In our research we have applied this to sustainability functionaries in Belgian Flanders.

Roorda & Rachelson (2018) describe seven competences for the sustainable professional, including the motivated environmental manager and the teacher. Their book is addressed to all kind of professionals, to check their own sustainability competence level on their workplace, be they the CEO, manager or office worker. These competences are responsibility, emotional intelligence, systems orienting, future orientation, personal involvement, action skills and professional dependent competences. Their research is based on concrete examples from all kind of North American, Dutch and Belgian professionals who showed one or more of these competences. However, sustainability functionaries have to realise the change process not only in their own workplace, but also within their target groups. Are these competences also relating to the experiences of Belgian sustainability functionaries, realising a change process towards environmental sustainable behaviour within their target groups? Do they practice all these competences or are they still experiencing competence-bottlenecks? Perez Salgado et al. (2018) analysed the "intervention competence" in depth and suggest further research on how this competence might be acquired, for instance enhancing conditions for informal learning on the job, and further research in which competences for sustainable change can be learned. Are these characteristics of the intervention competence also applied or recognized by the successful functionaries in Belgian Flanders?
No literature was found about the bottlenecks for change in Belgian Flanders, as experienced by sustainability functionaries.

In regards to these suggested scientific gaps, this research maps competences in relation to individual experienced environmental sustainability functionaries that achieved one or more successful identified change process causing also politicians, managers, craftsmen in various professional branches, average citizens, including the audience of secondary school communities, to adopt an environmental sustainable lifestyle. This study also explores encountered bottlenecks, to identify the required competences to tackle the bottlenecks. Most experienced environmental functionaries had to learn these competences for a great part on the job, often helped by multiple interdisciplinary training and many years of transboundary cooperation, because specific academic sustainability training programs were rare at the time. Empirical scientific research on competences in relation to successful environmental sustainability functionaries in the field has not yet been performed in Belgian Flanders. The relevance of the demarcation of the in-depth exploration concerning possible competence-bottlenecks related to their target audience of secondary school communities is explained in 2.1.5.

Mapping the competences and competence-bottlenecks that were used or experienced in real life situations leading to one or more effective change process towards environmental sustainable behaviour within the less motivated part of society, contributes to process oriented knowledge production by cooperation of professional expert experiences to scientific research. This knowledge will be useful to speed up further change processes towards environmental sustainable behaviour within society. Moreover, the first batch of experienced environmental functionaries will soon retire (Vincent & Focht, 2008) which means it is now the ultimate moment to explore the competences they practiced to manage earlier successful change processes towards environmental sustainable behaviour in Belgian Flanders.

2.3. Research Aim

The aim of this qualitative research is to explore and map the competences, including competence-bottlenecks, that experienced senior Flemish environmental sustainability professionals with a sensitization responsibility practiced, or require, to realise a lasting change process towards environmental sustainable behaviour within Belgian Flanders' society, through the target audience of secondary school communities.

The study starts by gathering the reflections and insights of experienced practitioners who already show their competences and abilities, realizing one or more successful change processes towards environmental sustainable behaviour within the average citizen population in Belgian Flanders. This study aims to gather process oriented knowledge and insights in the cluster of competences necessary to succeed in the intended change process towards environmental sustainable behaviour, in interaction with those experts:

- through 'confrontation' of the results obtained from the workshop and the subsequently held interviews, concerning the methods and associated skills, knowledge and attitudes used, with characteristics of competences mentioned in scientific literature,
- through exploration of the difficulties, or competence-bottlenecks to realize a change process towards a continuous environmental sustainable behaviour within their target groups.

Although this study has no comparative aim, the results are compared to the characteristics of competences found in the literature review, in function of their possible meaning to the change process towards environmental sustainable behaviour in Belgian Flanders, as experienced by the participating functionaries. Verschuren & Doorewaard (2016) use the term "confrontation" instead of comparison, to emphasise this specific way of comparison. This research does not intend to measure competences. Most participants have already shown proof of their competences and abilities.

3. Main research question and sub questions

Main question:

Which **competences** do functionaries, employed as environmental sustainability professionals, require to succeed in realising a lasting **change process** towards environmental sustainable behaviour in Belgian Flanders' society, through secondary school communities?

Subquestions:

1. Which characteristics of competences are described in scientific literature as necessary to realise a change process (in general, or specific) towards environmental sustainable behaviour?

2. Who are the functionaries, employed as environmental sustainability professionals, that have already succeeded in realising a change process towards environmental sustainable behaviour in Belgian Flanders?

3. A) Which competences have these functionaries practiced to accomplish this successful change process within their target groups in Belgian Flanders?

   B) Which bottlenecks have they experienced to accomplish this successful change process within their target groups in Belgian Flanders?

   C) Which competences do sustainability functionaries require to tackle the bottlenecks for change towards environmental sustainable behaviour, related to secondary school communities?

4. Research design and research methods

This explorative research uses a qualitative approach to find an answer to the main research question. Different qualitative methods are used, complementary to the iterative literature review, to gather expert opinions and in-depth knowledge in answer to the several sub questions. Quantitative data were used for selection of participants and reflecting on identified success cases.

The research consists of (1) an iterative literature review, (2) the selection of participants and a participatory action research consisting of (3a and 3b) a workshop followed by (3c) individual personal interviews, in order to explore the answer to the respective sub questions. As we wanted the participants to explore their own dimensions of the competences they practiced during their career to solve the specific sensitization problems, the method required direct engagement with the lived experiences of the participating professionals (Perez Salgado et al, 2018). Both researchers and experienced professionals from different Flemish authorities were involved in dialogue during a workshop, followed by interviews, thus leading to different types of data from different kind of sustainability professionals. Participatory action research (Creswell, 2014) in iterative confrontation to literature review, has to lead to an answer on the main question, through empirical exploration of practiced competences by experienced and successful functionaries. This triangulation of individuals, data and methods enhance the accuracy and validity (Verhoeven, 2011).

4.1. Research design

The research design, including the different steps to answer the main question, is presented in figure 4. The data obtained by the workshop and the interviews are iteratively analysed in comparison to the literature review. The first cluster of competences appearing as a result on sub questions 3 (A) and (B) are then returned to the participants of the workshop for feedback. The interviews are prepared in function of the in-depth exploration of the competences required, to tackle the bottlenecks for change towards environmental sustainable behaviour in Belgian Flanders. The results of the interviews in confrontation to the results of the workshop, result in an answer on the main question. Feedback of the participants is included in the results.

*Which **competences** do **functionaries**, employed as environmental sustainability professionals, require to succeed in realizing a lasting **change process** towards environmental sustainable behaviour in Belgian Flanders' society, through secondary school communities ?*

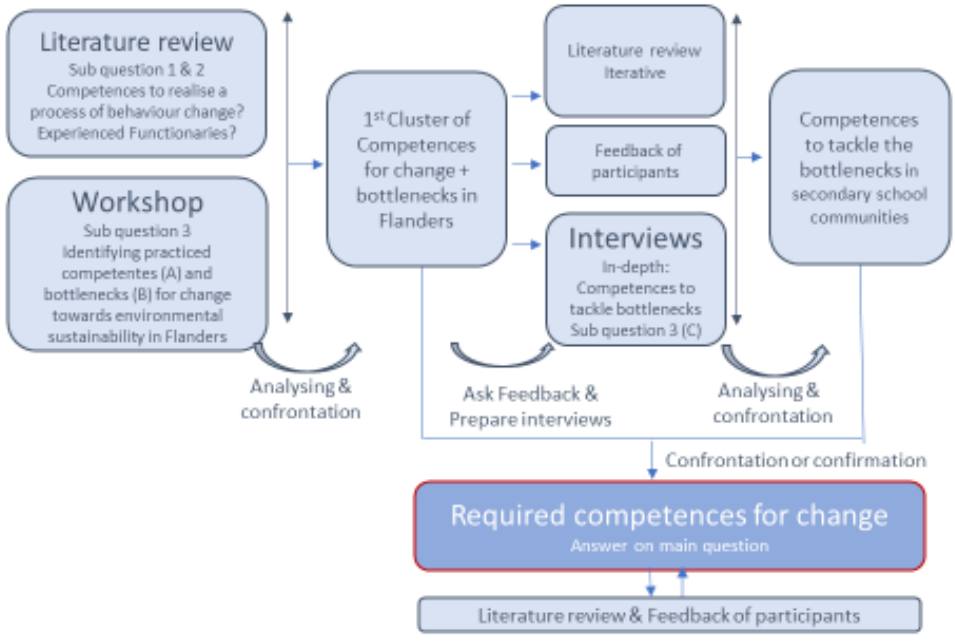

Figure 4: Research design

4.1.1. Participatory action research

In accordance with the arguments of Willard et. al (2011) and Perez Salgado et.al (2018), exploring the competences from the point of view of the practitioners themselves, grounded in their lived experiences and their professionalism in intervening, is an appropriate way for an adequate understanding of the practiced competences and the encountered competence-bottlenecks.
Willard et. al (2011) used a broad survey to obtain information about sustainability competences. In our study, the objective is to explore in-depth which characteristics of interlinked competences were practiced or required by functionaries to enable the aimed change process, despite the bottlenecks encountered during their career. Dialogue is essential to discover the practiced dimensions that might be fitting to a broad spectrum of possible competences. Dialogue is also necessary for an adequate understanding of these dimensions and bottlenecks. A survey, even with open questions, would be too restrictive here, because participants as well as the researchers might need supplementary questions for deeper understanding of, and reflection on the complexity of the practiced competences, the experienced bottlenecks and their interrelations.
Where this degree of participation is essential to explore lived experiences in-depth, in dialogue and direct engagement of the experts with the researcher, a participatory research method was considered to be the most appropriate to gather insight into competences and their consequential validity.
The participatory part starts with a workshop, where scientists and professionals search together for an answer on the sub questions 3 (A) and (B), using back-casting techniques. The identified characteristics of practiced competences and the experienced bottlenecks are then compared with the competences mentioned in scientific literature. The second part of the participatory research consists of 5 individual interviews for in-depth exploration of the required competences, or competence-bottlenecks, to overcome the bottlenecks for change towards environmental sustainable behaviour related to secondary school communities (sub question 3 C).

4.1.2. Analysing the collected data

Collecting and involving interdisciplinary integrated expert knowledge, expertise and skills from the participants, can contribute to scientific knowledge and insights about how to organise the aimed change process within society. To translate the different characteristics of knowledge, skills and attitudes mentioned by the practitioners into required competences however, specific terminology as found in scientific literature is necessary. All the collected data of the participatory research are therefore iteratively ‘compared’ to the competences mentioned in several scientific documents found through the literature review.

The corresponding dimensions or characteristics of competences found through the literature review are then individually selected for use in function of their possible meaning to the change process towards environmental sustainable behaviour in Belgian Flanders, as experienced by the participating functionaries. Verschuren & Doorewaard (2016) use the term “confrontation” instead of comparison, to emphasise this specific way of comparison. Confrontation has no comparative aim. The results of the participatory part, perceptions of experienced practitioners, are just translated with the corresponding terminology of scientific literature, while the results of the literature review are then individually restructured in function of their meaning in the context of the results of the participatory part, namely in order to obtain knowledge on competences that enhance a change process towards environmental sustainable behaviour in Belgian Flanders. This confrontation also increases the validity because the results of the participatory research are hereby also evaluated and structured on the basis of previous research concerning competences and their dimensions in other countries or in other contexts.

4.2. Methods

4.2.1. Literature review

Using a literature review we first explore the gap in scientific research concerning competences practiced by sustainability functionaries. Further literature review has the purpose of finding characteristics of competences which are defined in scientific literature as necessary to realise a change process towards environmental sustainable behaviour, in order to answer the first sub question.

The literature review was split up and aimed to explore a scale of competences and their characteristics defined in scientific literature as necessary to realise a change process, environmental sustainable behaviour **or** to form sustainability professionals in general. These competences, as well as those found in a further iterative literature review, were a guideline for coding and analysing the results towards the final report.

Another aspect of the literature review consists of selecting the most appropriate research methods. Four course books shape the main sources for the used methodology: Verhoeven (2011), Creswell (2014), Baarda (2014) and Verschuren & Doorewaard (2016). These methods were also found in scientific publications about exploring competences.

Meanwhile data collection from internal documents of Flemish authorities and personal communication have to explore success cases where a change process towards environmental sustainable behaviour was identified in Belgian Flanders, after intervention of some leading functionaries, mainly in the 1990s. Official statistical data of Caplo, the governmental service collecting data from municipalities such as average weight of garbage, numbers of citizens bringing sorted garbage to container parks, … and also other authorities in combination with snowball sampling, lead us to a selection of functionaries linked to successful change processes, in answer to the second sub question.

Finally the literature review is an iterative process and the competences resulting from the literature review are also used for analysing the data of the in-depth interviews and forming the final results on the main question.

4.2.2. Selection of participants

Participant sampling was based on existing data of identified success cases, followed by snowball sampling. For the workshop a maximal variation within success cases was achieved. Finally, concept sampling and opportunistic sampling (Creswell, 2014) were used for selection of the participants to the in-depth interviews. The list of selected participants is added in attachment 1a for the workshop and in the interview manual for the interviews (attachment 6). The selection of participants was performed in answer on sub question 2:

Who are the functionaries, employed as environmental sustainability professional, that have already succeeded in realizing a change process towards environmental sustainable behaviour in Belgian Flanders?

Criteria were:
- functionaries of diverse Belgian Flanders authorities in relation to environmental sustainability (maximal variation sampling for triangulation of individuals: local and higher authorities versus functionaries related to secondary school communities)
- having a minimum of 15 to 20 years of experience in sensitization related to sustainability

- **and** proven competences through identified success cases of behaviour change within their target groups, as mentioned in internal documents of municipalities and higher government services, or strongly recommended by previous selected participants.

A change in awareness can be measured by surveys asking people to evaluate their own behaviour change. However, measuring their energy saving, rubbish weight or biodiversity in their garden, can give more objective results of effective behaviour change (Ohman, 2011). This method was also practiced by “ecoteams”(Global Action Plan, 2008) and municipal covenants in the 1990s, when about 300 municipalities in Flanders signed an agreement with the government to start great sensitization actions. The amount of garbage reduction, energy usage, renewable energy, the number of visitors at recycling parcs and tourists participating in guided walks in nature reserves etc, was measured continuously by municipalities. In some regions the positive evolution in the 1990s was remarkable, as the amout of pollution was high before. The behaviour change after sensitization actions was identified by success rates, namely identifying the positive results of the obtained behaviour change, such as the reduction of the ecological footprint, or the increasing number of small-scale water treatment, ecological roofs, …. It has been noticed that some municipalities achieved successful behaviour change very early, due to efficient sensitization projects. The selection of participants therefore was based on this positive change, from back to front searching for the functionaries driving this identified positive behaviour change.

The successful change process has to be reflected in an identified positive change in environmental sustainable behaviour that became perceptible to the majority of the target group, late followers included. The participants must therefore manage certain competences in order to be able to initiate a change process, taking into account the actors and factors that may constitute obstacles affecting the late followers. For example: a municipality where solar energy was used by households long before government gave subventions, or where a strikingly large percentage of waste was sorted for recycling in the early years of container parks, etc.

Taking into account the necessary time to be able to identify the effective sustainable change process and to detect bottlenecks, mainly successful functionaries with at least 15, preferable 20 to 30 years of experience were selected. These pioneers undertook much training to achieve the necessary competences, both in education and in-depth sensitization to initiate change processes to citizens, school communities included. These professionals might have learned specific competences from other competent experts in change processes to practice a local specific change process towards environmental sustainability at different ages. For this reason it might be important to consider also a wider range of competences for change, practiced by successful experts on different scales, selected by snowball sampling in addition to the first selection of environmental functionaries.

The main environmental sustainability functionaries leading successful innovative projects (“success cases”) could be identified by analysis of the official data of Flemish supervisory authorities such as

- Vlaamse Vereniging van Steden en Gemeenten and Caplo (VVSG, 2005), analysing the municipal reports in relation to the municipal environmental covenants with the Flemish government,
- municipal reports dealing with environmental sustainability parameters,
- MOS-Vlaanderen, the data registering authority for ECO-labelled school communities in Belgian Flanders. According to Vanden Branden (2015) there were in 2015 about 40 schools in Flanders (of the 1051 secondary schools in Belgian Flanders) that have tried to complete a revolution in this respect in order to get the label, but not all exampling school communities participate in the MOS-label projects.

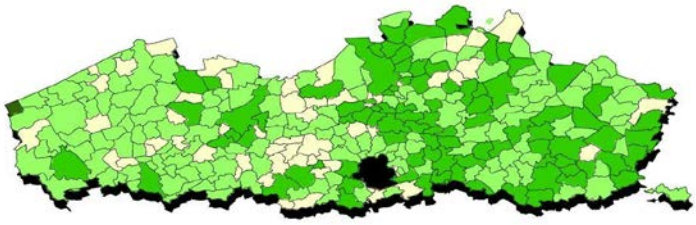

Figure 5: Municipal environmental covenant with the Flemish government (VVSG-Caplo, 2005) White: no participation of municipality (just following legislation criteria); Light green= municipality taking actions to reduce pollution to criteria on level 1 through elementary or structural projects concerning water, air, waste, energy, soil and education/sensitisation; Green= municipality succeeded in reducing pollution on level 1 and goes for further action to reach criteria of level 2 through a collaborative approach; Dark green= municipality succeeded level 2 and has an accepted transdisciplinary project of area-oriented policy to reach a further change process on level 3 with the main stakeholders on its territory.

The first municipal environmental covenants started from 1991 to 1996. Municipalities were encouraged to structure and measure their environmental policy, while presenting first-line environmental care possibilities to their citizens concerning water, solids, energy, mobility, natural entities and nuisance (WVI, 2005). The second (1997-2001) offered options for environmental priorities, in addition to the continuity of the first covenant. The following environmental covenant (2002-2007) included the earlier 6 vertical clusters and added the horizontal transboundary themes of target groups and area-oriented policy, now splitting the clusters into several levels. Signing for the third level was admitted only when the first and second level were reached for all clusters. The levels were judged and assigned by Caplo, based on measurement data, observations and descriptions of the impact of the municipal policy on the local environment.

Taking account of the aimed diversity of participants and their ability to participate in the workshop on the planned day, snowball sampling was used to complete the selection of experienced professionals involved in this study to a maximum of 25 for the workshop and 5 for the interviews. Snowball sampling also increases the transboundary approach. For each selected participant a motivation was added, describing the successful case(s) linked to the functionary.

A total of 60 functionaries were selected and invited first by phone and then by official e-mail to participate, until 25 responded as able to participate in the planned semi-structured workshop on 21/02/2019. A motivating factor for participation was to be involved with the further research.

20 professionals effectively participated. They were divided into 5 groups, ensuring the triangulation of participants.

Group 1: municipal environmental functionaries

This group consisted of experienced local functionaries dealing with local politicians, industry, local schools and citizens, including secondary school communities. Their identified success cases were for example:

- Projects of co-creating between local school communities, citizens and municipality.
- Using fair-trade products in municipalities and (school) events.
- Reducing the amount of rubbish, getting municipality and citizens starting to recycle in the ‘90s.
- Reducing the use of pesticides, getting municipality and citizens use biological or mechanical alternatives.
- Convincing municipality and citizens to use renewable energy already 30 years ago.
- Driving a cooperative multidisciplinary team including industrials, politicians and citizens for CO2-neutral, zero emissions action programs in the city, convincing also opposite stakeholders for behaviour change.

- Reaching at least level 2 of the environmental covenants and recommended by Caplo, VVSG or colleagues as being successful and exampling functionaries in general having good scores at reaching late followers.

All these municipal functionaries also had to sensitize the school communities on their territory, each in their own creative way. They have up to 40 years of experience leading to some successful cases where obvious behaviour change took place in local society.

Group 2: teachers and nature-guides

These participants have up to 40 years of experience in dealing with pupils and other target audiences related to school communities, especially in sensitization for change towards environmental sustainable behaviour on the field. They are/were teachers but also work as volunteers such as (inter)municipal nature-guide for example, or leading sensitization campaigns for sustainable change. Their success cases are mainly:

- Getting the members of their school community to act as environmental responsible citizens, also when they're coming from families with different cultures.
- Recruiting volunteers: to clean up plastics in nature reserves, to educate other individuals about nature or to organize sensitization campaigns.
- Cooperating with municipal authorities for making nature developing plans, actions protecting biodiversity or spreading information to citizens, schools and tourists.
- Motivating school communities to drink water from the tap instead of buying plastic bottles and reduce their water wastage .
- Cooperating with intermunicipal water providing enterprise and succeeding in closing the water cycles.

These success cases are not proven by quantitative data referring to behaviour change. They were recommended by municipal environmental functionaries as being local icons who started many projects that are now achieving or running successfully. Their projects are realized thanks from support of their target groups, accepting a long lasting change towards environmental sustainable behaviour when participating.

Group 3: functionaries working as educator/teacher in nature-education centres

The selected educational functionaries of this group were recommended by the provincial and Flemish authorities because they are the link between their environmental policy and the visitors of their museums, namely citizens, tourists and schools. They were recommended for their successful campaigns such as week of the sea, week of the bee, and educational programs for schools visiting the museums. Their success is mainly based on a high number of participants following their campaigns, but don't refer to behaviour change because this is unfortunately not measured by these instances. This group also consists of somewhat younger functionaries. They might use other methods and competences to make successful campaigns and recruit a large number of visitors to learn something about nature and sustainability. Towards validity it has to be noticed that here the aimed behaviour change is not measured, but they represent another (quite large) group of functionaries dealing with sustainability-education in Belgian Flanders during the past 15 years through visitor centres (triangulation of individuals and time).

Group 4: nature management functionaries

The identified success stories of these selected functionaries are situated in:

- Learning from local target group behaviour change for finalising details of higher nature management plans.
- Cooperating with municipalities and citizens to create nature developing actions supported by citizens (nature in the city, choosing for native plants and no more pesticides for example).

- Realising a project of sustainable neighbourhood where citizens use renewable energy, try to consume sustainable food from their biological gardens etc.
- Organising projects where people learn to live within and enjoy nature again, recruiting and educating citizens to become a nature- or sustainability guide (self-supporting change-agents, self-supporting behaviour change).
- Convincing municipalities for supporting Natura 2000 and other nature developing projects.
- Reducing the use of pesticides by municipality to zero level.

These participants have up to 40 years of experience and realised several projects leading to an obvious change towards environmental sustainable behaviour within their target groups and nature reserves. They were strictly recommended by municipal environmental functionaries because they were examples to them along their career for dealing with, and increasing the support among politicians and citizens for change towards sustainable behaviour .

Group 5: sustainability professionals dealing with a wide range of stakeholders or having experience in several domains

These participants have about 20 to 30 years of experience in sensitization actions on several levels. Some have been successful municipal environmental functionaries and later working for higher governmental and non-governmental organisations. Here the success cases lead to:

- Sensitization of tourists, obviously reducing litter on the beach.
- Motivating citizens for more sustainable consuming (less meat, less plastics, ecoteams, ….)
- Actions making surfers worldwide feel responsible for clean beaches: Eneco beach clean every year in Belgium.
- Organising earth hour WWF (worldwide).
- Protection of the oceans / dealing with plastic soup / educating ocean using stakeholders.
- Educating politicians, functionaries and citizens towards a better understanding of climate change and their impact.

Their success is based on both the significant increased number of participants (self-propagating yearly actions) and on the municipal or scientific measurement of the effects of behaviour change due to long-scale local sensitization actions in cooperation with their target groups, going from adolescents to grandparents.

For the interviews, the selection of participants were selected by concept sampling (Creswell, 2014). This means they were purposefully chosen to help discover specific concepts of the preliminary competences resulting from the workshop, because their multidisciplinary expertise in social science, linked to both behaviour change processes and education in secondary schools, might lead to possible competences to tackle the bottlenecks identified during the workshop.

4.2.3. Workshop - participatory action research: Empirical exploration of competences practiced in success cases

To explore the competences practiced in success cases, and also the bottlenecks for change, a participatory research method was used. Creswell (2014) proposes action research as the most applied practical design to explore possible solutions to a practical problem related to educational research. Experienced functionaries participated in the research, exploring through back-casting techniques which competences they used to succeed in this problem-solving. This research uses a participatory action research, where researchers and specific experienced practitioners are cooperating and exploring solutions. Participants also have a role in making interpretations of the study results. Feedback of the participants on the results is included in the process for validating the data.

A workshop with experienced functionaries was organised, in order to identify their practiced competences, leading to the expected change process (sub question 3A). Also the encountered bottlenecks (sub question 3 B) were explored during the workshop, in order to identify the specific required competences to overcome these bottlenecks for change.

A workshop creates the opportunity for the experienced participants, to co-create new insights based on their own life experiences, through mutual reflection (Perez Salgado et al., 2018). Exchanging information about their practices, can lead to specific overlapping dimensions, factors, conditions and connected links between their practiced competences (the possible influencing variables) to obtain a successful change process (the dependent target) towards environmental sustainable behaviour within their specific target groups.

Bergold & Thomas, (2019) mention the fundamental principles of Participatory research:

- Democracy as a precondition (Belgian Flanders)
- The need for a “safe” place (no fear of being attacked for saying something wrong)
- A defined “community” of participants (see selection of participants)
- Different degrees of participation (participants also contribute to results)

To create a “safe” place, the participants were assured that the reports will secure their anonymity. Moreover, all participants will also stay involved through the different phases of results. This participative action research incorporates the comments by all participants before and after formulating the final results. Before submitting a scientific peer-reviewed publication, all participants will be contacted by e-mail for feedback.

The workshop was coordinated by three researchers, experienced in different disciplines connected to the research item of competences and sustainability. This contributes to the validity of the process and its conclusions.

The location of the workshop was chosen in relation to the geographic spread of the domiciles of the first 8 selected participants that accepted to participate on the fixed date. Several possible locations were proposed by the participants and by education centres themselves. The provincial visitor centre Duinpanne at the Belgian Westcoast offered an appropriate location, accessible by public transport. It has to be taken into account that once the location was fixed, it also had a minor influence on the next invited participants. Selected participants of Western Flanders agreed more easily to participate, while others from the eastern provinces didn’t, but agreed to participate in the subsequent interviews or the peer review.

The participants of the workshop were asked, in preparation to the workshop, to reflect in written form on their successful and less successful actions aimed for environmental sustainable behaviour change among their target groups. Regarding their relatively long careers, this preparation was meant to have structured starting points for the workshop. A template to fill in, was sent by e-mail to help them without any obligation to use the proposed structure.

By the start of the workshop, a theoretical frame was presented by the researchers, defining “competences” and their “dimensions” for this research, followed by the instructions for data-collecting. A competence is considered to be an integrated set of knowledge, skills and attitudes that enables a certain observable outcome (Stoof et. al, 2002; Lambrechts et.al, 2013).

The workshop took 3,5 hours and was divided in two phases: a divergence phase and a convergence phase. During the first phase, the participants were divided into five groups of 3 to 5 professionals, pre-divided as mentioned by the selection of participants. Two groups included only the functionaries (mainly teachers) related especially to secondary school communities, while the other groups included environmental professionals from local and higher authorities, dealing with the target group of local society, including secondary school communities. The action research here is concepted from back to front: the participants are experienced senior professionals (functionaries trying to enhance

environmental sustainable behaviour within society) and were invited because they already succeed in realising a certain behaviour change (each group on a different level) within their target groups. Starting from the conditions in which their successful change processes took place, the selected professionals were asked to explore the different competences they have learned and practiced to succeed in realising a change process towards environmental sustainability behaviour within their target groups. To which competences do they owe this success? The workshop started thus with a reflection of their individual actions, with the purpose to discuss and distil a sort of common used or required competences in order to improve the aimed behaviour change within society. Through discussion with each other in small particular groups, they identified for themselves, the components of competences they had to learn and practice during their career, extracting the competences to which they owed the aimed change process within their target groups, but also the bottlenecks they encountered. Also the circumstances in which no change occurred were asked to be explored. (think & analyse).Each group had to write their reflections on a flip chart with markers of different colours. Three colours had to distinct 1) their case and context description (blue), 2) the knowledge, skills or attitudes they practiced (red) and 3) the bottlenecks they encountered (green).

The working in small particular groups contributes to co-produced knowledge about their practiced competences. The common findings of each separate group were formulated and written on a flip chart.

Each group came to a summarised collective back-casted action plan of most important dimensions of competences they practiced in context. (review or evaluate successful cases and bottlenecks – how did they act– collective plan as a reflection on practiced skills and (in)evitable bottlenecks).

During the convergence phase of the workshop, each group presented their common findings to all other groups (look, building the picture how other groups of functionaries practiced), followed by a plenary reflection. The different findings were discussed. They also had to discuss how to solve a specific range of bottlenecks that emerged. The discussions during the workshop were written down by one of the researchers, while the other researches asked questions for in depth exploration of mentioned bottlenecks, and possible skills to tackle these bottlenecks.

4.2.4. Analysing the observations and data of the workshop

A) Data collected during the workshop
The inductive process of co-producing knowledge during the workshop delivered a wide range of data. The flip charts were copied completely (attachment 3 a), and the discussion notes taken from the mentioned researcher (attachment 3b) were checked separately within a week by the other two researchers, which were also present during the workshop, and agreed upon the final version. The working language of workshop was Dutch. The collected data was analysed in Dutch, and later the results were translated by the researcher into English.

B) Analysing the collected data: coding
The empirical facts obtained by expert opinions during the workshop, were analysed in confrontation with the characteristics of competences defined in earlier scientific documents as necessary to realise a change process. Verschuren & Doorewaard (2016) use the term “confrontation” instead of comparison, to emphasise the specific way of comparison, where an observation A, here the dimensions of competences mentioned by experts, is assessed on the basis of another (theoretical or empirical) context B, the literature review about both competences for change and competences of sustainability practitioners, to draw conclusions in function of C, namely their possible meaning to behavioural change towards environmental sustainable behaviour within secondary school communities. Confrontation is represented schematically by a double arrow from which a conclusion is drawn.

The data of both parts of the workshop were translated into the terminology of the interdisciplinary literature review that was used for coding. The dimensions of competences

resulting from this confrontation (attachment 4) were sent to all participants for comment or approval. The hexagons as presented in attachment 4 a, b and c were a tool to weigh and then re-order the principle clusters of competence-dimensions that were mentioned both in literature and with similar words by the practicing functionaries.

C) Distilling competences and bottlenecks for change
The resulting characteristics of competences which were practiced to succeed, and which were mentioned to overcome some common bottlenecks, were re-ordered into competence clusters, highlighting the collective competences and their characteristics leading to success in the aimed change process towards environmental sustainable behaviour in a certain context of conditions, stimulating factors and bottlenecks in Flanders society. Clustering the competences and distilling the competence-related bottlenecks, resulted in a preliminary frame of principal competences leading to a change process towards environmental sustainable behaviour within society, in answer on sub question 3 A, and a list of experienced bottlenecks for change towards environmental sustainable behaviour in Belgian Flanders, in answer on the sub question 3 B.

The aim of these first results of practiced competences in context, and the encountered bottlenecks, is to detect the competences which require further in-depth exploration through the interviews.

4.2.5. Interviews

For the in-depth exploration of the required competences to tackle the bottlenecks, individual interviews were considered the best available tool to collect data from professionals with positive experiences, especially using competences, reaching the target audience of local secondary school communities.

5 interviews were taken for in-depth exploration of these selected competences and their characteristics, in order to find an answer on the sub question 3(C), concerning the competences to tackle the bottlenecks.

The participants for these interviews were selected by concept sampling (Creswell, 2014). This means they were purposefully chosen to help discover specific concepts of the preliminary competences resulting from the workshop, because of their multidisciplinary experiences in these specific domains of social sciences, linked to both education and change processes. During the workshop, some dimensions of competences were already mentioned as possible solutions to overcome or prevent some bottlenecks. Two participants were selected out of the first list of functionaries who did not participate to the workshop. Due to the emerging nature of qualitative research, the three other participants for the in-depth exploration were selected by opportunistic sampling (Creswell, 2014). This purposeful sampling happened after the unfolding insights that the competences required to overcome the main bottlenecks, might be reflected by other experienced experts in behaviour change processes, having more experiences with social sciences. The researcher encountered these experienced professionals in sustainability-related trainings. Selecting these participants was meant to provide insights from other experienced professionals, looking at the bottlenecks from another point of view, while exploring the competences they use to overcome these bottlenecks.

The selected participants were contacted personally or by mail to participate to a face-to-face interview of ½ to 1 hour. One interview was taken by iterative mails (e-mail interview), because the participant declared to always respond this way to interviews. The questions were open-ended and semi-structured, starting with some prepared questions related to the competence-bottlenecks mentioned in the workshop (see interview protocol), followed by in-depth questions related to the given answers.

Participants were asked which strategies or competences they already had or would practice to overcome some bottlenecks in context, as occurred through co-producing knowledge during the workshop. The first questions were demarcated to a specific context close to their successful professional activities conducting change processes, for example deliberately choosing for more sustainable food in a vocational secondary school for hotel and restaurant management. This was feasible because according to Harvey & Norman (2007) these experienced professionals “have a unique ability to apply their knowledge in the way that always works best in a particular context".

The interviews were recorded with permission of the participants (Olympus stereo VN-541PC digital recorder), and transcribed into a word file. Open, axial and selective coding will offer a framework of the resulting competences to overcome the selected bottlenecks. After coding and confrontation to competences from literature, the results were anonymised..

We compared the result with the literature review. In this phase it has the aim to assess the competences which were explored further in depth, in function of their utility to behaviour change towards environmental sustainable behaviour in, or through secondary school communities, in order to code and analyse the results of the interviews.

This part of the research had to give an answer to the third sub question, and has the aim to get insights and define also the required competences to overcome the bottlenecks to realise a change process towards environmental sustainable behaviour within society, through secondary school communities.

Finally, the connections between the results in answer to the sub questions had to be explored. The different (dimensions of) competences resulting as an answer on the sub questions were judged by interpretation of the mutual similarities and differences and their meaning to the aimed change process in the context of secondary school communities.

The answer on the main question of this explorative qualitative research had to be a frame of competences and their dimensions, grounded in the collected data, namely the view of the participants through a constructivist approach, and the consequential validity of the competences. The answer on the main question is presented by a visual model. Validation is an active part of the research process, through triangulation in each part, audit trail and negative case (bottlenecks) exploration.

4.2.6. Reflection on validity, reliability and ethical aspects

The quality and the choice of the methods have an impact on the validity and reliability of this research.
Validity is the degree to which the used methods and instruments score or match for the proposed purpose (Creswell, 2014). Here the purpose is exploring required competences for change towards environmental sustainable behaviour. Reliability concerns the consistency or stability of the appearing results and the accuracy of data-collection.

Internal validity

The selection of participants is based on collected documents and recommendations of professionals, recognized as the driving force leading cases where sustainable behaviour change appeared in Belgian Flanders. These mainly senior, experienced participants are appropriate to determine the preconditions for success, considering the consequential validity of their practiced competences in relation to these identified successful cases (Luken, 2008). According to Schmidt & Hunter (1998) the description of the longitudinal process of the success-cases (identified success cases over a long period) in combination with personal interviews, improve the score of validity to high and very high in terms of evaluating competences. By interviewing different respondents driving sustainable change

processes within various target groups, the answers are validated from various angles (triangulation of individuals). To increase internal validity, the interviews are recorded. Then the sentences are literally written down and the quoted elements are worked out in a report (at.8 p.33). Results are compared with the competences mentioned in earlier scientific research. Validation is an active part of the research process, through triangulation in each part, audit trail and negative case (bottlenecks) exploration.

External validity

The external validity refers to the possible generalisation of the results to other similar cases.

The involved research population for this study is restricted to 25 to 30 participants. This has the risk that the generalizability of the conclusions is not optimal. A careful selection of respondents attempts to compile a generic group of experts. Respondents experienced with also the social sciences related to behaviour change in broader context, contribute to generalization of the results to comparable contexts in relation to sustainable behaviour change. The inclusion of teachers of different school communities and environmental sustainability professionals with a wide range of target groups, can expand the possible generalisation to other target groups.

The empirical exploration of practiced competences by experienced and successful professionals working with different target groups and on different domains of environmental sustainability in Belgian Flanders, happens through a participatory action research (Creswell, 2014), consisting of a workshop and individual interviews in iterative confrontation to literature review. The workshop was coordinated by three researchers, experienced in different disciplines connected to the research item of change towards environmental sustainable behaviour. The comparison to the results obtained by literature review also increases the external validity because the results of the participatory research are hereby evaluated and structured on the basis of previous research concerning competences and their dimensions in other countries or in other contexts. This triangulation in the selection of individuals, comparing the gathered data and triangulation of applied methods, enhance both the accuracy and validity (Verhoeven, 2011).

Internal reliability and accuracy

During the divergence phase of the workshop the different participants are divided into groups with similar target audience and a similarity in their successful results, because there is a risk that their answers show differences: not all participants reached the same level of success or have the same interpretation of success, relating to behaviour change. For the teachers for example, no measuring or evaluation of behaviour change was found on longer time scale, while the municipal functionaries have to send the measured evolution every year to get approval and grants from the government (WVI, 2005). This deliberate breeding of the groups, followed by mutual reflection during the plenary convergence phase of the workshop, has to enhance the internal reliability.

The workshop was led by three scientists and 20 selected professionals were participating. One researcher analysed the provided data, which were all written down and read by the other two researchers. For that purpose the practiced methods and intermediating steps leading to conclusion are added in attachments.

The confrontation of the resulting elements of competences to the similar elements found through literature review, was sent to all participants of the workshop for feedback. This triangulation of individuals enhances the accuracy of the data. The participants corroborated the results. The interviews were taken by one interviewer. This has the advantage that the same interview procedure was applied to all the respondents. The interview manual is added in attachment 6. Due to time restriction, five interviewees were selected. In the event that this research is to be conducted by someone else, the semi-structured interviews should provide the same results on the basis of the respondents' answers, if the interviews are conducted with the same questions to the same group of

interviewees. To increase internal reliability (and accuracy), the questions and answers of the interviews were recorded and written down literally before coding. The final results were sent to the participants. Their feedback is considered in the conclusions.

External reliability

A goal of good research is to have reliable data which should provide the same results if the same research methods are applied with other participants in a similar context. This means the scores have to be stable and consistent before they can be meaningful (Creswell, 2014). The selection of participants, based on different experience with success-cases (different years of experience and different degree of success-cases, expanded to transdisciplinary experiences of behaviour change through the interviews), has the advantage that the resulting competences will have a high reliability towards a successful process of environmental sustainable behaviour change. It has to be noticed that although the aimed behaviour change is not identified by all participants' target groups and not all participants have at least 20 years of experience, these sub-groups of (mainly younger) participants still represent a group of functionaries dealing with sustainability-education in Belgian Flanders. By involving these participants in separate sub-groups the possible mutual differences of provided data among the experienced functionaries can be traced to enhance the accuracy and generalization of the results. For the interviews experienced participants dealing with sustainable behaviour change both in general and related to environmental sustainable behaviour are involved. This transboundary triangulation of individuals (spectrum of time of experience, degree of success and spectrum of target groups related to secondary school communities) has to enhance the possible reproductivity of the results in further similar research relating to competences for change towards environmental sustainable behaviour.

Ethical aspects

The results contain no names of participants. All the results for publication are anonymized so that they can't be traced back to personal level. The attachments are separated into public attachments and confidential information. The confidential information is not put into an attachment of this thesis. The participants were asked permission to write their full names in the internal documents. The participation to the workshop and interviews is on a voluntary basis. There is no hierarchical relation between the participants and the researcher. Respondents could withdraw from the study without giving a reason. The research is conducted for a master thesis. This excludes the investigation from any commercial interests that may influence findings made during the investigation.

5. Results

5.1. Literature review results

The literature review addressed sub question 1:
Which characteristics of competences are described in scientific literature as necessary to realise a change process (in general, or specific) towards environmental sustainable behaviour?

The literature review was split up and aimed to explore a scale of competences and their characteristics defined in scientific literature as necessary to realise:

- environmental sustainable behaviour (in general)
- sustainable behaviour change ,
- **or**
- to form sustainability professionals in general (other than functionaries).

Several competences were found when the literature study was split up in these different parts. For instance, Vincent & Focht (2010) mention as important skills and competences of the sustainability professional: communication skills, analysing skills, solving problems and environmental questions in particular, and competences in leadership. In the International Society of Sustainability Professionals, sustainability professionals from North-American enterprises mention following key competences: good communication skills, strategic planning, system thinking, project management, scientific expertise and reporting skills (Willard et al., 2011). Metcalf & Benn (2013) describe what different competences a good leader in sustainable development needs, and also a model for complex problem solving in the context of behaviour change processes. Gonzalez-Marcos et. al (2015) designed an ICT method for measuring leadership competences required for project management. Perez Salgado et al. (2018) analyse two complementary competences for interventions towards sustainability in depth: the intervention competence and the transboundary competence. Barth et al. (2007) describe different theories about how all these competences can be learned and achieved, and their different characteristics. Roorda and Rachelson (2018) developed a framework of seven competences required for sustainable professionals in different professions, including a detailed toolbox for measuring the level of competence.

Searching for the separate competences in the selected broader contexts of behaviour change or sustainability, results in a large list of possible dimensions of competences, possibly important to realise a change process towards environmental sustainable behaviour.

Hence only separate characteristics of competences result to this first sub question. The explorative action research has to give more insights in which of these dimensions of competences are used by functionaries and effectively lead to a process of environmental sustainable behaviour change in Belgian Flanders' society, and especially to the target group of secondary school communities. These competences found through literature review in broader context are used in confrontation to the results of the workshop.
The results of this literature review are presented in attachment 2. Table I compromises a slightly edited version of the competences found from the literature and their characteristics. All these, but also competences found in further iterative literature review, were a guideline for coding and analysing the data from the workshop.

Table I: Results of competences found through literature review

Authors	(Dimensions of) competences	Competence / context
A. Competences for sustainable professionals (to be sustainable in whatever profession)		
Roorda & Rachelson (2018)	Responsibility	Task oriented competence
	Emotional intelligence	People oriented competence
	Systems orienting	Place oriented competence
	Future orientation	Time oriented competence
	Personal involvement	Attitudes: who you are
	Action skills (overarching the 5 precedent competences	Decision and intervention
	Here structures, methods and contents for teachers and environmental manager in general	Professional dependent competences
B. Competences for sustainability professionals (selection useful for functionaries, focus on sensitization for change)		
Perez Salgado, Abbott & Wilson (2018)	Decisions and motivating to act	Intervention competence change process towards sustainability
	Lived experience	
	Political-strategic thinking	
	Goal-oriented Action	
	Adopt & communicate Ethical practices	
	Cope with complexity	
	Collectively produced propositions and decisions	
Metcalf & Benn (2013)	Leadership for sustainability	

Runhaar, Driessen & Vermeulen (2006)	Policy competences	In the role of policy maker and in the role of spectator
C. Competences for change in general		
Rogers (2003)	Awareness knowledge & how-to knowledge	Diffusion of innovations
	Convincing competence	
	Trials to enhance decision	
	Change agent credibility	
	Implementation (collective)	
	Time dimension	
	Opinion leadership & education	
Kollmuss & Agyeman (2002)	Intrinsic motivation	Barriers to pro-environmental behaviour
	Environmental sensitivity	
	Environmental awareness	
	Emotional involvement to complex problems	
US Department of health and human services (1998)	Promote client knowledge, client skills & attitudes Motivational competences Recognizing client strengths Feedback to client progress Comprehension Coaching, mentoring, teaching Underlying client issues	Addiction counselling competences for behaviour change
D. Competences for change towards sustainable behaviour, assessed in (academic) higher education programs		
Vega-Marcote, Varela-Losada & Alvarez-Suarez (2015)	System thinking	Teacher training as a basic pillar for change towards sustainable behaviour
	Anticipatory competence	
	Normative competence	
	Strategic competence	
	Interpersonal competence	
Brundiers, Wiek & Redman (2010)	Problem solving	
	Action competence	
	Collaborative competence	
	Strategic knowledge cluster	
Remington-Doucette et. al (2012)	System thinking	Understand the whole & the many levels of interrelationship
	Values, collective design & implementation skills	Normative and strategic competences
	Anticipating and detecting possible unintended consequences	Competing values, consequences for different stakeholders and challenges
	Know how to get things done Strategic knowledge for action guiding to stakeholders	Recognize barriers and how to overcome those barriers
	Learn about non-linear phenomena + back-casting	Sustainability competences
	evidence suggesting that humans do not have the natural mental capacities to understand and manage complex socio-ecological and technological systems	Pedagogical competences
Wiek, Withycombe & Redman (2011)	Systems thinking Normative competences	Anticipatory competences Strategic competences
	Interpersonal competences	
	Basic competences : critical thinking, communication etc.	
Vincent & Focht (2008)	Transboundary competences Connecting various communities	Natural, social, political, cultural, technological,

		ecological & applied sciences
	Temporal and spatial scales	Non-linear complex processes
	System-oriented thinking	Problem solving
E. Tools for change among youth and secondary school communities in general		
Kollmuss & Agyeman (2002)	more environmental education does not necessarily mean increased pro-environmental behaviour	
Girault & Sauvé (2008)	importance of involving environmental sustainability competences to science curricula in general education	
	Citizens need to learn specific competences in general school to be able to change their behaviour and think, then act in a sustainable way: importance of citizen intelligence: be critical towards the amount of propaganda; ability to negotiate, argue, to resist to temptations, to transform to upgrade yourself and to accept responsibility	
	Education in and through nature	Positive experiences in real nature; physically and emotionally impregnated human, as part of nature
	Knowledge & insights in critical social approaches + the link of humans to nature	Empathy for natural environment
	Responsible Decision skills	Developing Values
	Interdisciplinarity and transdisciplinary (science + history, geography, languages, use of materials, discuss dilemmas, ask experts for help)	Transboundary curricula in integral assignments
Van Poeck & Vandenabeele (2012)	Learning from sustainable development instead of learning for sustainable development	Shifts the focus from required competences to (presenting issues of) the democratic nature of the spaces and practices in which participation and citizenship can develop
CVO VIVO (2017) coursebook	Psycho-pedagogical competences	Bottlenecks to competence developing during adolescence
Luken (2008)	Development of awareness and responsibility versus ego	

All these characteristics were translated into Dutch, for later confrontation to the results of the workshop and the interviews.

5.2. Results of the workshop

The results of the workshop address sub questions 3 (A) and (B).

Which competences have these functionaries practiced to accomplish this successful change process within their target groups in Belgian Flanders?

Which bottlenecks have they experienced to accomplish this successful change process within their target groups in Belgian Flanders?

The results of the workshop are written in Dutch in the attachments, due to the spoken language of the functionaries in Belgian Flanders. The translated competences of table I were separated into different neutral dimensions of competences, designed as hexagons, to accentuate their possible interrelationship (attachment 2a and 2b). The separated characteristics have to assure the objectivity when configurating into competence-clusters in confrontation with the results of the workshop.

5.2.1. Results of the workshop: aspects of competences and bottlenecks

The raw data of the workshop are presented in attachment 3. Table II shows a (translated to English) overview of the skills, knowledge & insights, and attitudes that were mentioned by the participating

functionaries, and the main bottlenecks they encountered. For reasons of conciseness, overlapping and recurring words were bound together.

During the global discussion with all groups together (the converging phase), in-depth questions were asked, such as “How do you take decisions?”, “How do you evaluate?”, “How do you make your project self-dispersing?” and in-depth questions about the bottlenecks, such as “Why can’t we reach level 2?”, “Which competences are we missing to get a sustainable change process?”. The answers of each group are included in table II. A detailed transcription is added in attachment 3a and 3b - Raw data of the workshop,.

Table II: Elements of competences (knowledge and insights, skills and attitudes), or aspects required to initiate a change process towards environmental sustainable behaviour within society (secondary school communities included), and the encountered bottlenecks, as identified by sustainability functionaries and teachers (summary)

Knowledge/Insights in	Skills	Attitudes	Bottlenecks
Group 1 municipality environmental functionaries			
The Problem			complexity
Previous studies		Be Objective	
Numbers/measurements		Be critical	
The aim		Focus on aim	
What has been done before	Analyse what was good in previous actions or on other places. Know what to hold and what to change	Learn from experiences	
How to measure result		Use good examples from time and space	Not always measurable
Aim of the enterprises (they want you to consume)			Society wants to consume too (threat for environmental behaviour)
Needs behind the needs	Persuasive communication	Be Positive, constructive	Propaganda on social media
	Plan-do-act-check		Too many other tasks
			Lobby of enterprises on politics (with strong tools)
Other factors influencing politic choices	Communication skills	Be brave, don’t give up	Short time politics (elections): first aim is to be re-elected
All Stakeholders and their aims			Too many stakeholders
Legislation	Compromising skills	Be consequent	Legislation is too restricted for innovation
Impact of action on environment	Project management		
	Process management	Be passionate	
Present situation of stakeholders and possible conflicts/impacts of decisions	People management	Be transparent in decisions	
What your stakeholders can bear	Take decisions	Creative / Out of the box	
	Build a social network		
	TEAMWORK	Be honest and open	
Group 2 Teachers and nature guides			
	Enthusiasm your helpers	Be enthusiast, vital	Too less helpers taking over the responsibility
Situation of local politics		Don’t give up	Need local politicians
	Broad communication of campaign and results	Be neutral in politics	Misunderstanding by stakeholders
Aim and stakeholders and their aims		Hold focus on environmental behaviour aim	Troubles in own team, other opinions
	Time action when public		Conflicting aims and

	opinion can bear it Persuading competences		gains No one to address to (no person who wants to be responsible for environment at school)
	Work together with stakeholders Advising stakeholders		Very slow decisions
Learn about the system, possible solutions, …		Be open to (constructing) critics	Critics are seen too much as negative
	Talk also with extern experts Bring people together (network)	Be equal and neutral, consider values as equal	
Know the world of your stakeholders	Personal communication	Empathy	Conflicts: not through social media!
	Let them enjoy nature in nature No double agendas		You need a kind of mighty position
Examples	Give examples/samples to show	Be a consequent example	Always the same persons taking all the responsibilities
	Give the feeling of ownership (of decision) to stakeholders	Be glad when others get the prices with your idea	
	Do what you feel what's right to do		
Group 3 educators from nature education centre			
	Start from needs of stakeholders		
Who is ready to act?	Choose for stakeholders who are ready to act. Negotiate with stakeholders		Lack of support within own organisation
	Filter a common action or gains		
	Organise many information moments	Be communicative	Cost of educators/time
Stakeholders like Media attention	Feedback moments with media attention		
	Continuity of action or repeat actions		
	Give practical materials to stakeholder		Costs/budget
	Link municipalities Personal contact	Empathy	Distance/time
	Split goal up to small goals (quick wins)		
	Decisions immediately for parts of consensus		Conflicting arguments of political green fraction was no reason to stop
	Take initiative Play in on actuality	Be flexible	
	Share success stories with colleagues and stakeholders	Show personal involvement	
	Think and do	Be not too 'educating' / pushing	
	Use the power of a symbol		
Group 4 functionaries of sector nature development			
What can stakeholder propose?	Implement ideas from stakeholders: what can they propose?		
	Infiltrate within stakeholders (local)	Be involved, integrated	
Know the structures on macro and local scale	choose for local		Structures are not so flexible anymore in Flanders
	Search for team with same aims		

	Listen to the needs of stakeholders Implement action to the local needs	Be listening	
how do others do, what works, what doesn't?	Check your vision international! Check your vision on previous research	Be passionate	
How was the state of biodiversity in past and what do we want for future?	Measure and analyse in present, past and future aims	Dare to purchase your dreams to ideals	
	Concrete actions and concrete aims	Hold focus on environmental aim	
Success stories in 1957 and 1970	Use Infrastructure to encourage and lead		Subventions / costs
New problems in 1990s	Evaluate!		
	Lead where necessary, say what's wrong and why!	Stay open for discussion	Incompetent municipalities showing no involvement
	Dare to debate	Be engaged	
	Bring same-thinking people together (network) to encourage them		
All stakeholders	Bring ALL stakeholders together		Political bottlenecks
Strong build knowledge	Disperse strong build knowledge		Complexity for citizen
	Make the knowledge stream to all Clear communication of sustainability and aim	Be understandable, connected	Scientific knowledge of citizens
What/how do stakeholder want to help	Organise collaborative inspiration moments (co-creation) Give responsibility to team within StH Let them feel ownership/responsibility Quick wins are welcome Learn them to love nature		
	Knowledge only when they ask for it	Make them curious	Intrinsic motivation
Other solutions	Show other methods, other themes, scenarios	Be emotional intelligent and broad-thinking	
	Look at it from view of stakeholder Make choices also when conflicts. Know how to handle conflicts Find WIN-WIN scenarios for nature and stakeholders	Be understanding	
	Search for compromises when necessary	React adequately in time, place and attitude	
	Search for partner in politics strong enough to make decisions		Nature developing plan was signed but no money nor team to implicate nor follow-up
Know what happened in previous times	Translate complexity to understanding		
Insight in the real problem/ what nature can bear Know how to solve the problem	Take account of the needs and arguments: why not participating?	Accept/promote their success with their or your ideas	
	Evaluate of the problem is still		

	a problem, or if it is that big you thought		
Importance of self-regulating projects	Educate motivated stakeholders to be a guide, ensure the dynamic for diffusion		"you are too smart to explain and I am too simple to understand"
	Disperse your passion for nature also to laggards	Don't have prejudices	
	Stimulate/delegate ownership		
Group 5 professionals from diverse government levels working with NGO's about oceans and sea and who had multiple functions during their career			
How to enlarge the support	Enlarge the support		Reach to not interested stakeholders
	Motivate your volunteers	Empathy	Asking energy for continuity
What is possible	Concrete demarcated recognisable aim		
	Simplicity for communication & realistic		
Event knowledge	Communication skills (also digital)		
Mainstream/hypes	Use mainstream		But know hypes don't last
Relevance (time-connected)			Tiredness
New solutions	Flexibility of action: change when new insights		
What can be positive for participating stakeholders?	Customize to needs of stakeholders		
Power of momentum	Use Power of symbol and repeated momentum	Hold on to continue	Starting up requires a lot of energy
			Always new input necessary
Everything is connected	Analytical thinking, system thinking. Forget thinking in separated boxes!	Be broad minded	Forget thinking in frames, but society does …
	Dare to decide and DO	Dare to dream	
Know your stakeholders	Understand your stakeholders	Be trustable	
Importance of co-creation for responsibility	Stimulate co-creation and bottom-up for responsibility and motivation		Structures in Flanders don't allow co-creation easily
	Educate and give responsibility to all without prejudice. No pre-knowledge is required, no entry-restrictions.		
	Start with easy aims first		
	Make your project self-bearing		
	Give stakeholders responsibility to be an example		
Know that this is not first hype: 1970; 1990, …. And still more plastics and CO_2	Complex problems require interdisciplinary cooperative teams thinking out of the box	Be critical	Society still believes in technological solutions in future
	Check if your problem and solution is still relevant and sustainable in time		Lack of insight and knowledge from social sciences for behaviour change
	Thinking out of the box together with other existing structures and stakeholders		Horse faeces were big problem but cars were solution. Now much bigger problem
	Search for sponsoring (network of stakeholders having wins by sponsoring) = economic and strategic thinking skills		

	Importance of story-telling

In attachment 4 (raw data from the workshop in confrontation to literature) the results as presented in table II were coded in confrontation to characteristics of competences found through the literature review, to enable mutual comparison, and for a common notification of the dimensions of practiced or required competences as quoted by the functionaries. Mutual comparison between the groups is shown in attachments 4a to 4c, to obtain an indication of the weight of the competence-dimensions (found in literature) in confrontation to the workshop. Almost all competences found through the literature were identified during the workshop.

The different groups of functionaries mention both common and different competence-dimensions. Furthermore, some mentioned elements of competences are conflicting or lack among the groups (for example no follow-up so no idea if change process happens, priority of knowledge-education versus experience for intrinsic motivation, power of momentum but hypes don't lead to sustainable change process, …). Some elements are only mentioned by group 4 (the power of infiltrating, forming new intrinsic motivated leaders without prejudice).

Otherwise, some groups come with competences which are possible solutions for the bottlenecks of others. Groups 1, 4 and 5 for example mention skills and attitudes to succeed in a sustainable, self-steering change process, though argue that this was not always guaranteed despite their continued efforts. Group 2 and 3 don't evaluate the resulted behaviour change and mention the evaluation as a bottleneck, while groups 1 and 4 quote the evaluation of behaviour change as indispensable to be able to adjust their actions and decisions. Group 2 quotes too less helpers taking over the responsibility as one of the biggest bottlenecks, and all groups agree unanimously about this bottleneck. The bottlenecks mentioned by group 3, representing educational functionaries of the relative new nature education centre, are mainly related to costs, time and disagreement within the own organisation. Due to the distance to their target groups and the concept of their educational centre, they mainly invest in knowledge about nature. Their success is measured by the increasing numbers of participants. These differences were also accentuated by the mutual questions during the discussions. That is why in attachment 5 the weight of the results is not given only related to the number of groups citing a certain competence or dimension of competence. A question for further analysis through the interviews, is to explore if these differences in mentioned competences can make the difference for succeeding in a sustainable self-steering change process towards environmental sustainable behaviour reaching also late followers.

5.2.2. Results of the workshop in confrontation to literature: competences

In attachment 5 the results of the workshop (containing aspects of competences) are ordered into different clusters to form competences, after translating the mentioned aspects into the terminology as used in scientific literature. They form the results of the workshop (table II), in confrontation to the results of the literature review (table I).

Taking into account the amount of mentioned aspects of competences during the workshop, and their importance appearing during the discussions, the results of the workshop, in confrontation to the individual characteristics mentioned in literature, can be summarized into a cluster of six competences, which we labelled as followed:

- 'Complex environmental problem-solving project management'
- 'Collaborative innovating people & team management'
- 'Responsible decision making & Action'
- 'Analytical evaluation & Adjusting'
- 'Transparent communication'
- Sow/fuel/coach/give birth to key competences for change within the target audience

The sixth competence is required to enable a lasting change process. However, the name and interpretation of this competence requires further in-depth exploration. Below we give a description of each competence, with exception of the sixth one, which requires further in-depth analysis (see 5.4. results of the in-depth interviews).

The competences are interacting and they have overlapping characteristics. The most common mentioned elements formed the basics to cluster the dimensions which seem to be related, when analysing the quotes. In attachment 5 the elements of competences are represented by hexagons to emphasise their independence out of context and their possible interconnectivity in context. For example, 'transparent communication' is quoted as very important by all groups. Other quoted knowledge, skills and attitudes related to transparent communication are merged into a cluster containing all other during the workshop mentioned characteristics belonging to the same competence. By this sort of selective coding, the core categories are selected in context, systematically relating the elements of competences from literature to the prior elements mentioned by the experienced functionaries.

These results, as shown in figure 6, give an answer on the sub question 3 (A). The resulting converted competences are presented in the order as they are practiced by most of the functionaries, starting at the upper part with the 'Complex environmental problem-solving project management'.

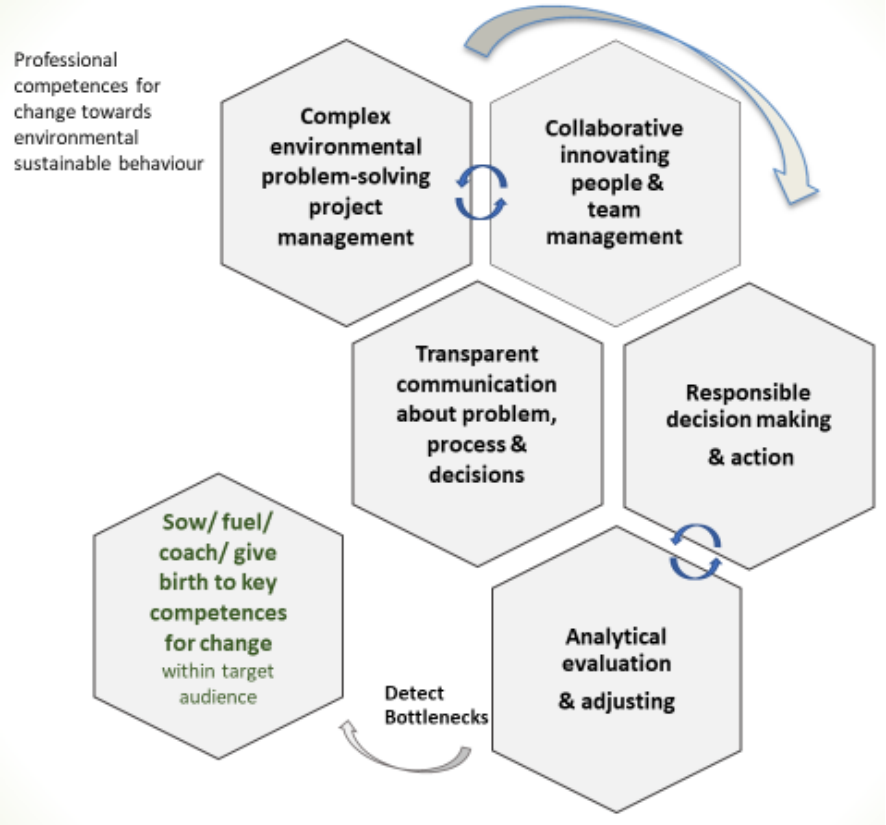

Figure 6: Schematic presentation of competences of senior environmental sustainability functionaries, to accomplish a successful change process towards environmental sustainable behaviour within their target groups in Belgian Flanders. Start reading upper left, spirally relating each competence to transparent communication. Analytical evaluation reveals the bottlenecks for change, and the necessity of the sixth competence to 'sow/fuel/coach/give birth to key competences for change within the target group, which requires in-depth analysis and which is further investigated during the interviews.

Almost all quoted knowledge and insights, skills, and attitudes, grounded in the lived experiences of the successful and experienced functionaries, are comparable to those found through literature

review. Remarkable is, that the competences were situated in a very broad spectre of knowledge contexts, going from sustainability science to social sciences, from competences to be a sustainable professional in a great variety of jobs, to competences for education and behaviour change (see table I). These successful sustainability professionals seem to be all-round. That's why the participants all quote the importance of working in inter- and trans-disciplinary **TEAM:** It is quasi impossible to practice all these competences by one person, especially not in the beginning of their career.

In first instance, many aspects of competences were mentioned, comparable to the skills, insights, knowledge and attitudes for leading a **complex environmental problem solving project**. "Problem solving" is also rated as the 'top skill' by Willard et al (2010). Here, the 'Complex problem-solving project-management' competence includes the system thinking and strategic competences of Wiek et. al (2011), Remington-Doucette et. al (2012) and Vega-Marcote & Varela-Losada (2015). Brundiers et al. (2010) call it the cluster of problem solving, collaborative competence and strategic knowledge. Wiek et. al (2011) argue the necessity of conceptually bound clusters of competences. During the workshop the participants clearly mentioned the characteristics of these different competences in the concept of 'project management'.

All these characteristics are also recognizable in Roorda & Rachelson (2018), within their place and time oriented competences, including systems orienting and future orientation, and in the intervention competence of Perez Salgado et al. (2018), more explicit to cope with complexity, goal-oriented action and political-strategic thinking.

In parallel, or in interaction with the important core competences to solve complex problems by project managing, politic strategic thinking and system thinking included, they also require the competences related to transparent communication and facilitating bottom-up through cooperation with all possible stakeholders. This '**Collaborative innovating people or team management'** competence, includes knowledge and skills such as 'knowing what stakeholder need', 'find common values', 'teamwork', 'co-creation' and 'bring all stakeholders together', which are common to 'connecting various communities', as cited by Vincent & Focht (2008), 'collectively produced propositions and decisions' (Perez Salgado et al., 2018), 'values, collective design & implementation skills' (Remington-Doucette et. al, 2012), the 'collaborative competence' (Brundiers et al., 2010), the 'interpersonal competence' (Wiek et. al, 2011; Vega-Marcote et. al, 2015) and the 'people oriented competence' of Roorda & Rachelson (2018).

Then it is crucial to have the knowledge, skills and attitudes for adequate, **responsible decision making to start action**, also during the process, taking in account the possible consequences for all stakeholders and for environment. Roorda & Rachelson (2018) also include characteristics of this competence in their 'Action skills'; Perez Salgado et al. (2017) call it 'Decisions and motivating to act'; Wiek et al. (2011) mention these characteristics in 'anticipatory competences' and 'normative competences; Girault & Sauvé (2008) talk about 'responsible decision skills'.

These decisions and actions have to be continuously measured and **evaluated** by critical (self-) **reflection** and flexible adaptation of the tools where necessary. This '**analytical evaluation & adjustment'** competence contains elements of a (self-) coaching-process (US Department of Health and human services (1998). Wiek et al. (2011) and Vega-Marcote & Varela-Losada (2015) call it the anticipatory competence. Although this analytic evaluation and adjustment could be a part of the decision making, (because it happens continuously in interaction with) in this context it is useful to consider it as one of the main competences, due to its relation with the encountered bottlenecks and the next competence, namely to sow, fuel, coach or **give birth to key competences** for change within the target audience. This last competence results from the critical project-evaluation and self-evaluation by the experienced and successful senior participants, and it is also related to the resulting bottlenecks as presented in table III. Because this competence requires further in-depth exploration, due to its possible importance to overcome some bottlenecks, there is still doubt about the best fitting name. The name will then be chosen after the interviews, providing a more specific interpretation of this required competence for a self-steering or lasting change process.

The '**transparent communication of problem, process and decisions'**-competence concerns the knowledge of all stakeholders, the communication of knowledge about sustainability principles, the skills to report comprehensively and connectively about project and process, not losing the focus on the aim of the project, approaching the stakeholders personally, and the attitudes of being trustable, honest and a good example oneself. These characteristics are also cited by Roorda & Rachelson (2018) as characteristics of the People oriented competence and Personal involvement. Perez Salgado; Abott & Wilson (2018) call them the characteristics to 'adopt & communicate ethical practices'. Wiek, Withycombe & Redman (2011) mention communication as one of the basic competences. To emphasise the interaction with the 5 other competences during the whole process, it is placed in the centre of figure 6.

All these six resulting competences are interrelated and overlapping. In figure 6 they are presented as individual hexagons whereby the 'Complex environmental problem-solving project management'-competence has to be practiced simultaneously with the 'Collaborative innovating team or people management'. The project has to be managed in collaborative interaction with the stakeholders, forming a team with the leading functionaries for bottom-up implication of possible solutions. The 'Responsible decision making and action' competence has to be practiced simultaneously with the 'Analytical evaluation and adjustment' competence. Every responsible decision and action has to be evaluated and adjusted during the whole process. Decisions and actions take place during the whole process too. Finally all these competences are also continuously interacting with the 'Transparent communication of problem, process and decisions' competence. These competences also have common elements, or overlapping sides, as shown in figure 7. In-depth exploration has to provide more clarity about the completion of these overlapping sides of these hexagons, in addition to more knowledge about the required competences to overcome some experienced bottlenecks in general, and specifically the required supplementary skills, knowledge and attitudes for a self-steering, lasting change process.

Figure 7: visual presentation of the overlapping dimensions of the competences

5.2.3. Bottlenecks

The main bottlenecks are especially situated in the difficulties to maintain and enlarge the change process to the late followers. Some successful experienced participants mentioned the importance of coaching the new leaders among the early followers, follow up and delegating ownership or responsibility. Lack of experience with social sciences was also mentioned as a competence-bottleneck. The mentioned bottlenecks of each group are included in table II. Table III orders these bottlenecks in competence-related bottlenecks of the functionaries themselves and other bottlenecks, related to external persons or circumstances, and their target groups within society.

The complexity of environmental sustainability makes it not always easy to measure the impact of the project on both the environment and behaviour change (group 1). A resulting attitude is to skip the evaluation (groups 2 and 3). Knowing the stakeholders is essential to detect conflicting interests, but there are too many stakeholders to map, there is no time to overcome the distance for personal contact or to reach the less-interested stakeholders (groups 1,2,3,5). Group 4 mentions the gap to make the knowledge understandable for the stakeholders without frustrating them. The lack of people taking the responsibility affects the motivation to hold on, and also the target group shows tiredness after a while. Groups 2 and 3 mention the difficulty to agree within the own team. Social media reinforces the lobby of industry, politicians, businesses and conflicting interests within the consume-based society. Moreover, the short-term political system and the legislation are at odds to sustainability and co-creation (groups 1,2,4,5), while too many people experience all critics as negative (group 2). Realising that after decennia of hard sensitisation, people are still polluting, shows that hypes don't last (group 5). There are still so many laggards and deniers to the environmental sustainability problems, and even early followers sometimes give it up because holding on to

sustainable behaviour change seems so difficult. All groups mention the difficulty to keep enough energy for repetitive actions and to hold on.

The experienced senior functionaries mentioned repeatedly to "need more experiences from change processes from social sciences". Mutual evaluation during the convergence phase, led all participants to a critical self-evaluation, reflecting that there's still something missing to achieve a sustainable, lasting change process on the longer term. The main competence-related bottleneck seems to be the difficulty to reach a lasting, self-steering change process. This costs the functionaries a lot of energy, a lot of frustrating need for repetition, while still not reaching the late followers.

This critical self-evaluation was essential to discover which elements of competences they still have to learn or practice to overcome these important bottlenecks. Figure 6, representing the competence-results of the workshop, shows the link between their 'Analytical evaluation and adjustment' competence and the critical acknowledging of the encountered, still remaining bottlenecks.

Table III: Bottlenecks for change towards environmentally sustainable behaviour, as encountered by experienced functionaries.

Bottlenecks related to the competence-elements of the functionaries themselves			Other bottlenecks (related to other persons and circumstances)
Knowledge-related	Skills-related	Attitudes-related	
Complexity	Ability to measure or evaluate the change process	Lack of evaluation	Consuming-based society Publicity for not sustainable products and behaviour
Know your stakeholders	Too many stakeholders to map		Conflicting interests
			'Don't think in frames', but society still does
	Too many tasks, lack of time	Motivation to hold on	Lobby of industry & businesses influencing politicians Tools of influencing businesses are much stronger
Tiredness of target group after a while	Organisational skills linked to politics		Elections: short-term vision and political system is at odds to sustainability
	Ability to agree within own team	Avoid conflicts through social media	Don't accept critics, feel all critics as negative GAP:" I'm too simple to understand"
	Actions within restricted budgets		Legislation and inflexible structural procedures are restricting for innovation and co-creation / Too much administration
Social sciences linked to behaviour change	Find time and overcome distance for personal contact		Lack of people taking the responsibility
Scientific knowledge	Translate scientific knowledge to make it understandable		Incomprehension (of target group/politicians) at the start or not willing for participation Still polluting after 20 y of

		sensibilisation
Non-linear processes	Reach a wider support to late followers Reach a lasting change process, not a temporary hype	Believe in technological solutions because this also worked in history
Hypes are not lasting	Keep enough energy for repetitive actions	Difficult decision making of politicians

Out of this framework of resulting competences practiced in context, one specific competence emerges as a possible solution to overcome the remaining bottlenecks for a sustainable (rather self-sustaining) change process: the competence to 'sow competences within target audience'. This competence requires further in-depth exploration, especially to find or confirm the required elements of this competence, which might be related to the required knowledge, skills and attitudes to tackle some bottlenecks, because:

- Groups 1, 4 and 5 succeeded to maintain a less or more sustainable process of behaviour change. Group 4 really succeeded to maintain the continuity over several decennia through intrinsic motivation of nature guides for example. They think this is due to the transfer of their own competences for sustainable change to their target groups without prejudice. To be able to motivate and form early adopters (and also others!) to take the responsibility for supporting the change process and to become new leaders, dispersing the change process towards the late followers, might be the key to a successful, lasting change process.
- The bottlenecks 'tiredness of target group after a while', 'hypes are not lasting', 'keep enough energy for repetitive actions', 'reach a wider support', 'restricted budgets', 'overcome distance for personal contact', 'motivation to hold on', are mentioned to be possibly tackled when the amount of volunteers, in analogy to the nature guides, could share the required competences for further sensibilisation of the target groups. The bottlenecks of tiredness, consuming-based society and denial are also mentioned by Stoknes (2015; 2017). They argue that the target audience will not take action as long as the walls of denial, doom or dissonance they built is not broken or prevented.
- The bottlenecks related to other persons than the functionary him-/herself, such as 'difficult decision making of politicians', 'incomprehension', 'lack of people taking the responsibility', 'short term vision' and 'can't resist to strong lobby of industry', can be due to a lack of knowledge, skills or attitudes to overcome these bottlenecks by the target groups themselves. Where the functionaries succeeded to spread or coach some key competences within their target audience, a self-steering change process could be realized. In this case, the bottlenecks related to other persons, might also be related to competence-bottlenecks.

To explore in-depth which competences, or elements of competence they require to overcome these bottlenecks, other experienced professionals were interviewed, mainly experienced in change processes related to social sciences. The interviews focus therefore on clarifying the knowledge, skills and attitudes required to overcome the main bottlenecks that were quoted during the workshop, and their relationship to the resulting competences as shown in figure 6.

5.4. Results of the in-depth interviews

The interviews were meant to find an answer on the sub question 3 (C):

Which competences do sustainability functionaries require to tackle the bottlenecks for change towards environmental sustainable behaviour, related to secondary school communities?

5.4.1. Results from the interviews: further digging into the competences

The detailed analysis of the raw data obtained by the 5 personal interviews is added in attachment 8 A. The translated answers of the individual interviewees are summarized in a table in attachment 8 B. Four of the interviewees are professionals dealing with social sciences in combination with education in secondary school communities. One interviewee is a very successful environmental functionary, recommended by the approving authorities and by other environmental functionaries. This latter declares not to have many experience with education in secondary school communities, but with sensitization of many different target groups such as politicians, lobbying industrials, volunteers, his own team, citizens and NGO's. According to Harvey & Norman (2007) such experienced professionals "have a unique ability to apply their knowledge in the way that always works best in a particular context". That's why they easily could answer the questions, empathizing with the contexts of sustainability functionaries and the target group of secondary school communities.
Moreover, all interviewees have experience with environmental education or sensitization, but each from another point of view: as a teacher in a secondary school with a specific philosophical approach, as a philosopher teaching biology, as a science teacher coaching people with alcohol and drug addiction, as a sustainable food professional coaching teachers at cookery schools or as a municipal functionary leading also change processes in private organisations as a secondary profession.

However, it is remarkable that all interviewees systematically mention elements of competences required by the intended audience, in addition to the elements of competences required by the environmental functionaries. All respondents state that sustainable change can only be achieved if the choice for change of behaviour ultimately comes from the target person himself. Imposed change and trends or media hypes only cause a temporary superficial behavioural change, which can be useful in the case of urgency or 'laggards', but in the meantime we also have to work on personality competences. If we don't, the behavioural change is not going to continue when the hype is over. Moreover, the respondents repeatedly emphasized the importance of being able to sow your own competences within the target group. Statements such as "plant a seed" (I2), "let competences germinate" (I1), "delegate yours skills to cherish new ambassadors" (I3), "empower their individual strength" (I4), "making sure that the message does not fall on a hard stone, but in a place where it can germinate", … confirm the findings of the workshop, that awareness raising also requires competence to "sow" competences within the target group. Attachment 8 B includes an overview of the quotes whereby the interviewees are confirming the required 6th competence which was resulting from the workshop, namely the competence to 'sow key competences for change within the target audience' (fig.6), and how they individually fill in the characteristics of this specific competence.

The respondents also spontaneously cite the competence-bottlenecks, making it all too often getting stuck or leading to disappointment of the functionaries and volunteers (marked in green in the texts of attachment 8 A). The experience of the interview respondents with these bottlenecks, and how they could avoid or bridge these bottlenecks, confirm and provide the concrete interpretation of the competence to 'sow/fuel/coach/give birth to key competences within the target group' of figure 6, resulting from the workshop, and which required in-depth analysis through the interviews.
Table IVa resumes the resulting dimensions of the required 6th competence to enable a lasting or self-steering change process through the implantation or transmission of competences, as mentioned by the interviewees. The results of the interviewees are presented in a random order. An additional result provides the competences required by the target audience (table IVb).

Table IV: elements of competences required for a self-supporting and lasting change process towards environmental sustainable behaviour, as mentioned by the professionals during the interviews (summary).

A. Elements of the 6th competence, to 'enable key competences to germinate within the target audience', required by the (team of) sustainability functionaries to enable a self-supporting, and lasting change process towards environmental sustainable behaviour

Competence	Knowledge and insights: know (that)…	Skills: the ability to ..	Attitudes: be …
Stimulating responsibility and ownership	All choices, Possible solutions and their consequences	Bring people with good intentions together	A connector
	Change is the goal, but person has to choose himself how	Teach them how to deal with freedom, freedom separated from lobby	A mentor, an enabler
	The real problem	Explain, show the urgency	Honest
		Give something concrete to care for, give the ownership	Wanting to share responsibility
	Holding on is difficult If they feel alone with too much responsibility	Attach small steps Make them not feel despondent when others are not taking responsibility	Just acting because the **moral responsibility** is important to you
	You cannot realize this change to others alone. You need a team.	Form a team with responsible persons sharing the responsibility and ownership	
	The difference of children in primary school, accepting adults to teach them, and adolescence wanting their autonomy of choice	Explain and help when they ask for, Give the ability to take initiative, don't convince.	Not missioning, not intrusive
		Let yourself fade away, let it be 'their' idea. Promote autonomy.	Reserved
	Steering is a trap	Give the freedom to think: don't tell 'the' answer	
	People don't like to be commended	Show all possible choices, examples and their impact, without intervening in the will of the other. Only show what they can do and the consequences.	**An example, taking the responsibility and autonomy against lobby**
Fuelling inquisitiveness	The power of inspiring examples	Show them a world of solutions which are there waiting to be discovered by them.	Inspiring
	Only when there is interest I can show them more possibilities	Inspire them to see wonder, to marvel at nature	An role model of personality without emphasising this
	So many information, but how to find you way? How do you know what's true?	Offer facilities for change, help to find good information	Helping
	Complex cause-effect systems Insight in trustable scientific knowledge and insight in the nature of science	Dialogue and sow insights, explain to anyone when they ask for, without prejudice	
	They're not going to change if there is no need for, or if they don't feel the negative consequences of their actual behaviour	Make them feel the urgency for change and why	confronting
	The way to build up a session to enhance the interest	link examples and ask questions raising hunger for more	**Curious and inquisitive**
	Negative effects by cognitive tiredness: limits of cognitive load	Show examples without naming them	
		Tell stories of experiences of people who achieved great awareness in time and	

		space.	
	Other points of view, the broader picture, interesting materials in time and space	Show them how to see it from another point of view. Let them see the broader picture in time and space, other cultures,..	
	Know that in a group you not always get what you want	See other strategies of colleagues as a benefit to you. Listen to other's experiences & compromise	Learning from others' experiences
	Philosophical techniques	Stimulate thinking skills	
	Ecological insights	Let them realize what they don't know	
Raising critical (self- and target group) analysis concerning choices and attitudes	Ability to deal with complexity and uncertainties: does this decision or action make a difference? + Know what causes negative effect.	Ask difficult questions to which there is no answer to make them analyse and realise the complexity	Be both a conversation facilitator and 'difficultator'
		Sow doubt to stimulate thinking	Be clear about your values and those of the school
	The reason of not changing, from their perspective	Empathize with the thinking world of the target group	Empathising
	Students or target groups are also teachers to you and to each other	Accept to be inspired by your students, team or target group	Authentic, pure yourself
	Impact of secondary school and impact of the home. Insight in the bigger picture	Enable in-depth discussions about dilemmas, bring nuance in their principles	
	Opposition can be positive to you. Team or target group can bring you new insights.	Don't judge. Accept other argued choices and give it time to germinate.	Open minded, Not missioning
	Know that you can learn from their critics	Accept critics and opposition. Don't play the game of winners and losers	**Self-critical**
		Analyse how they react to lobby	Teasing, testing, provoking
	how our thinking is influencing our world	look through different glasses and how these are interacting (economy, ecology, ethics)	
	environmentally coloured hypes are not lasting. They don't change behaviour	Future thinking: how will we think when hype is over?	
	Your own motivation: for PR or because of moral responsibility?	Leave the spot lights, analyse content instead of reward	Humble, act without ego
	The best learning place is the home situation. But the impact of school environment, friends, make them challenge what they've learned at home, and if it doesn't meeting they'll change their behaviour (positively or negatively)	Ask them to reflect about their behaviour, while trying to think through their glasses, work locally, close, don't think in boxes, cross boundaries	
	Know their possibilities and abilities for change.	Facilitate them to make other choices / other behaviour	A facilitator , enabler
	A denier will deny as long as he doesn't feel the consequences of denying the problem	dare to tell honestly how it affects himself and the close when denying the problem, identify negative consequences, make them feel what they can lose if they don't change behaviour	
Personal coaching communication	Know what you want to achieve within the learner. Know that patience is a virtue but also a strategy	Trust in thinking process while not speaking: give time to think. Just sow the seed, give time and free choice to make it germinate.	Trustable
	Don't expect someone else to change just because you demand it: this brings aversion	Sow doubt and search together for possible answers, what is feasible and why or why not	Socratic attitude of non-judgment and not knowing the 'right' answer
		Explain the consequence of making choices, without arousing a guilty feeling nor	Diplomatic

		attacking the other	
		Coach with authenticity	Be yourself
	Goodmensch/ Schlechtmensch: the negative effect of the communication gap	Practice connecting communication and close the gap	Empathising
	Falling back begins with thought, then desire and obsession	Clear up tensions, assist when they're thinking to go back to old behaviour	
	Know the 4 reasons to fall back and take HALT when occurs: Hungry (lobby), angry, loneliness and tiredness	Work local with a small group for more impact and follow-up. Get started in a very concrete way TOGETHER with the local schools	Honest and clear in follow-up
	Holistic view: same approach for other problems	Listen why they want to go back to old behaviour	Personal, trustable, reachable (be there, close)

B. Elements of competences required by the targeted audience to make change possible

Interview 1	2	3	4	5
Skills for system thinking through philosophical (group)communication				
Thinking skills: Dare to doubt, Argumentation skills, Insight that they don't know either, Can think up new questions	Insight that if you can't think, then others will think and decide for you: learn to think autonomically		Talk to others about it, Don't stay alone, find like-minded people, discuss together, think and raise awareness	They first have to be aware of the problem to themselves and to others
Motivation to explore knowledge	Empathize: ah you see it that way?		Dialogue without urge to convince	
Think together/ dialogue, share visions, generate ideas to take action	Communication skills without persuasive attitude Respect for everyone's authenticity		Talk about it to others, find like-minded people, don't stay alone, think together and fuel awareness	They have to find (a new) entourage of other people wanting to change too
Deal with complexity and uncertainties	Dealing with setbacks		Future thinking (awareness of uncertainties or non-linear processes)	Absolute honesty to what I do and what I'm failing, and be able to see that
A self-fuelling hunger to more knowledge and insights				
Come to insights by research	Wanting to know more: Know that Knowledge gives you more autonomy		Once the awareness comes, they automatically ask for knowledge	When aware of the problem and insight of the possibilities they will want to change
Know, and know what you don't know: skills to deal with knowledge	Want to know all possible solutions and choices	Insight in the wider picture of nature and environment	Story-telling of success cases in time and space show your impact if you do it wright	Insight in the whole picture to realize that their behaviour will have to change
Insight of different contexts through dialogue	Interest for different insights, different views & choices		Insight in how people function: do not pressurize, then they make a negative choice	Insight in the reasons why you can fail to hold on sometimes
Insight in cause-effect systems	Insight in other cultures		See the broader picture to be able to use skills also in other context	
Know that science can change in time and also contains uncertainties	Insight in how to make qualitative choices		Intrinsic motivation: hunger for more knowledge and thinking skills	
Elements to become aware of your own choices and autonomy through Attitude of critical (self) analysis				
Insight in own values	Ability to make choices in a world with so many possibilities		Awareness to make responsible choices	Feel the intrinsic desire to make other choices
Know what you can	Develop virtues,		Know the effects of	Insight in other

do and if that makes a difference	empathy and characters to make choices with respect		your choices and the morality about it Ability to discuss why you don't choose for this	possible choices
Generate self-criticism with insight	What if I would change? It is possible!		Consider Why should I not do it?	Know what is wrong
Insights in temptations of lobby	Capacities to be able to row in real contemporary life		When pressure is used people make negative (not lasting) choices	Insight in their autonomy of choosing
	Insight in restrictions of our freedom, due to lobby		Stand and hold on against lobby	Be honest when experiencing setbacks, when failing, communicate
Elements related to the competence to take or accept responsibility				
Experience urgency	Sometimes change is inevitable (f.e. personal health)		See, detect your responsibility and what you can do	Reach a rock bottom to experience urgency
Feel ownership		Feel a great personal involvement	Perseverance, motivation to hold on	Experience/insight in negative consequences of your behaviour
Feel responsibility	Take responsibility		Just act because it is important for you, not for PR I Just act because it is my own responsibility	Accept the ownership of responsibility
Don't wait until others do	Don't wait, just act by yourself!			Learn how to take / how to deal with responsibility
Motivation for behaviour change by system thinking, insight in cause-effect and own values, and what is important to you			Dare to say 'I don't agree, I don't act like this': individual empowerment to take responsibility and make responsible choices	Motivation for behaviour change: this can't go on like this, I want to change

The knowledge, skills and attitudes to stimulate responsibility and ownership corroborate and refine the results of the workshop, where 'giving responsibility' and 'sharing ownership' were also mentioned as essential for a lasting, self-steering change process.

Fuelling the hunger for knowledge for both yourself and others, or the skills to stimulate questioning and encourage the curiousness, are very important to make the target group willing to understand the complexity of environmental sustainability. Gruber, Gelman & Ranganath (2014) found that once you light that fire of curiosity, you put the brain in a state that's more conducive to learning due to a ramp-up of dopamine. The learning about sustainability is then felt as a reward and moreover this curiosity improves the brain to remember what has been learned. Pluck & Johnson (2011) also state that curiosity is an aspect of intrinsic motivation that has great potential to enhance student learning, and might be more important than intelligence. In this respect, fuelling the inquisitiveness helps the target audience both to want, as to be able to understand the complexity of environmental aspects. If the target group in addition acquires the ability to take responsibility, they will also be able to dare to take action. Both competences 'Stimulating responsibility' and 'Fuelling inquisitiveness' are interacting and have overlapping dimensions.

Fuelling inquisitiveness also helps for critical thinking and self-analysis. Opening the world of other visions, other strategies, learning from others' experiences, helps both the sustainability professionals and the target audience to realise what they don't knew, and this can stimulate both the curiosity again, and the self-questioning or self-reflection on their own choices and behaviour. To stimulate this self-analysis in a secure way, the functionaries or volunteers require the knowledge, skills and attitudes related to personal coaching, especially concerning the communication skills and attitudes to stimulate the perseverance to hold on. This personal approach with a trustable, empathizing attitude was also quoted as an important competence-element during the workshop, especially concerning the competences for people management and communication. Manz & Sims (1991) call it 'super leadership', where the most appropriate leader is the one who can lead others to lead themselves,

where the commitment is based on shared ownership and where peoples' strengths are developed. The importance to stimulate people thinking about the problem without missioning, is also illustrated by a short video of Alliance for Climate Education (2018), based on the article of Lertzman (2017) where she claims that a more authentic and more personal, more listening mode of communication without forced expectations can actually enhance people's capacities for response.

Table IVa shows the overlapping, interacting characteristics. The elements quoted by the interviewees also overlap with, and hereby confirm characteristics of the other five competences (see fig. 8, confirming fig.6 & 7). As mentioned both during the workshop and by the interviewees, "thinking in boxes" is a limitation to the development of these competences.

5.4.2. Relation to the bottlenecks

Related to the sub question 3 C, it is remarkable that all the five interviewees immediately recognized the main bottlenecks that resulted from the workshop. On the question 'Which competences do sustainability functionaries require to overcome these bottlenecks for change towards environmental sustainable behaviour in secondary school communities?' they all referred to necessary skills for change required by the target group. The competences required by the environmental sustainability professionals have to include the sowing of, and enabling of the germinating of some key competences within the target persons (confirmation of the 6th competence). They emphasise their experienced knowledge that if these key competences for change are not available within the target persons, no lasting environmentally sustainable behaviour change can occur.

Moreover, if these key competences can be developed within the target audience, they should also contribute for positive behaviour change and prevention in other contexts, such as addiction to alcohol and drugs for example (I2, I4, I5). The answers from the interviewees are generally related to some bottlenecks experienced by the functionaries, as mentioned during the workshop (table III):

a) The bottlenecks related to other persons or circumstances (societal aspects), such as 'Consumer-based society', 'Publicity for non-sustainable products and behaviour', 'Lobby of industry & businesses influencing politicians', 'Tools of influencing businesses are much stronger', can, according to the interviews, be tackled when the citizens become aware of their autonomy of choice (I2, I4, I5), gather the knowledge of the amount of possible (other) choices and the impacts or consequences of their choices (I1, I2, I3, I4, I5), and then learn how to resist to lobby (I2, I4, I5). To reach the ability to make responsible choices, critical thinking skills have to be developed (I1, I2, I4, I5) , which fuel the hunger for more knowledge and insight (I1, I2, I4). This knowledge, in combination with system thinking, can overcome the 'Incomprehension (of target group/politicians) at the start or not willing for participation', and maybe also the understanding of 'conflicting interests' (I1, I2, I4) and 'believe in technological solutions because this also worked in history'. Developing the sense for accepting responsibility could lead to more people taking the role of ambassador, overcoming the bottleneck 'lack of people taking on the responsibility' (I1-I5). The thinking skills are also the key for critical analysis of products and choices, or self-criticism related to choices, values and attitudes (I1, I2, I4). The bottleneck 'can't accept critics, feel all critics as negative' could be avoided if all citizens should learn to accept feedback as a means to grow, and practice self-criticism in evaluating their attitudes (I3, I4, I5). Moreover, the quote 'Train your students so that they can take responsible decisions by themselves later and perhaps they can change the political or economic system' (I4) refers to the bottlenecks related to the political system ' Elections: short-term vision and political system is at odds to sustainability' and 'Difficult decision making of politicians' and 'Legislation and inflexible structural procedures are restricting for innovation and co-creation / Too much administration'.

b) These key competences, which have to be developed within the target audience, also have to be continuously practiced by the sustainability professionals themselves. To tackle the

bottlenecks related to competence-elements of the functionaries themselves (table III), such as dealing with the complexity of the problems or solutions, non-linear processes, uncertainties and other knowledge-related bottlenecks, the sustainability professionals continuously have to fuel their own inquisitiveness (I1,I3). Through philosophical questions they stimulate their own system thinking competence, useful for both the project-managing competence and the mapping of all their stakeholders. They have to organise their tasks efficiently and take actions with restricted budgets (I2). Therefore they have to make the most responsible choices with an attitude of critical self-analysis (I1-I5). They have to be able to work together with a great team of colleagues helping each other with respect for everyone's authenticity, and to coach their volunteers and targeted persons to hold on, to be resilient in sometimes difficult circumstances (I2-I5). The quotes 'See opposition as positive, know what you can learn from their critics' (I3), and 'plan intervention by someone else when necessary' (I4) and 'See other strategies of colleagues as a benefit to you and take advantage of others' experiences' (I3) summarise the importance of critical self-analysis by the sustainability professionals themselves, among the other quotes as mentioned by the interviewees.

5.4.3. Observation to characteristics of the participating professionals

Analysing the curricula of the successful environmental sustainability professionals, leads us to see that they are obviously lifelong students, interested in different disciplines, eager to learn. I1 and I2 also confirmed their "curiosity about other possibilities and cultures" and "curiosity about how both the world (nature) and people work together". During the workshop the participants showed to be self-critical, able to see and to admit their own weaknesses. Through the critical follow-up of the impact of their actions, they learn from both positive and negative experiences. They also switch flexibly from one role to another and thereby gain a broad knowledge field. Most of them take responsibilities in various fields besides their job, thereby building up a broad network. The third interviewee also cites this as "the way to sustain it and to charge the batteries" (answer to the persistence bottleneck).
The successful environmental sustainability professionals must possess the same key competences as those they have to develop and foster among their target group. These key competences overlap with the competences resulting from the workshop (fig.6 – fig. 7):

- The self-fuelling hunger for knowledge and insights, and the thinking skills such as arguing choices through cause-effect analysis, system thinking through dialogue and empathy, are necessary for both the project and people management.
- Accepting the responsibility is the drive behind people management and responsible decisions.
- To make responsible decisions it is indispensable to know all possible choices and their impact. Analysing the impact of the decision-making on the aim of the project and on the stakeholders, requires a critical (self-)evaluating attitude.

Prober (2016) cites these characteristics in her book as a feature of "rainforest minds", namely a strong sense of responsibility, passionate about learning about people and the environment, (self) critical and analytical, connecting very quickly through system thinking, and a strong willingness for taking action to change the world.

5.4.4. Relation to the target group of secondary school communities

Four of the interviewees explain why the change process remains so difficult and why it isn't lasting when using the contemporary methods both in society and in secondary school communities: 'There is something wrong with the education system in today secondary schools' (I2), 'The current classical education is inadequate in Belgian Flanders' (I2, I3, I4), 'Lobby affects also our education system'(I2, I4), 'Contemporary education is premeditated for you in such a way that it must meet a certain standard, but this is not how we create people who will bring about lasting change. This approach leads to the opposite: you get people who collectively but not independently learn to think.'(I4)

"Students detect that the teacher simply provides information that must be transferred from one to the other because it happens to be in that attainment target. There are even schoolbooks listing 1 and 2 etc. describing sustainability, but you do not create change with that.'(I4) 'Teachers give information but if the students don't have the skills to change, it is like seed falling on stone, and that will not germinate, unless in very exceptional cases.' (I2) A remarkable quote by Rudolf Steiner in 1924 (as cited in Seelen, 1998) already emphasised the importance of fuelling the inquisitiveness about people and the planet, whereby citizens 'should experience questions about the world and its people the same way as they feel hungry and thirsty', and 'answers should be given only when students ask for it', which confirms the required key skills for a self-fuelling hunger for more knowledge. In today's society knowledge is everywhere accessible while empathy for and personal experiences in natural environment become scare. The interviewees determined that these are no stimulating factors for the inquisitiveness, while education programs are not adapted to this societal change in Belgian Flanders.

Other insights given during the interviews, are 'The excessive knowledge regarding sustainability is too heavy for adolescents, they drop out, don't want to hear about it anymore'(I1,I2), 'the person needs to be addressed somewhere: what will he do with it?' 'In primary school it works, because beneath the 12 children still accept, even admire their teacher showing them how to act, they still enjoy nature too, but the circumstances in secondary school communities are different: teenagers get an aversion on the subjects which are imposed to them, they want to make their own choices and are very subject to the lobbying industry carrying them away from nature"(I2). This fact was also confirmed by Boeve-de-Pauw & Van Petegem (2013). Humans have the ability of free choices, but can they still bear the responsibility of responsible choosing in a societal context of infinite possible choices?

These statements argue the importance for the environmental sustainability functionaries to be aware of this underlying problems in secondary school communities. The interviewees state that secondary education should prepare the individual citizens, our target groups, for the choices and decisions that they will make in their later (working) life. This is also the aim of Van den Branden (2015), who also mentions 'passion for a life-long learning', 'creative thinking skills', 'asking questions' and 'making own responsible choices' as key competences which should be learned in 21ste century secondary schools. If the seed is not planted during the secondary school trajectory, as stated by the interviewees, this will lead to many bottlenecks for the sensitizing official. The civil servant and his team must therefore acquire the competence to sow and help germinate these key competences into the heads of their target audience, as these competences are indispensable to enable the aimed sustainable change in society.

5.4.5. Combining the results

The results of the interviews confirm and complete the characteristics of the required competence to 'sow/fuel/coach/give birth to key competences within the target group'. We had not yet found a specific appropriate name for this competence because the functionaries still had too many uncertainties about its characteristics. Moreover it was not found in other scientific literature. Some functionaries participating in the workshop actually had some positive experience in realising a lasting change process, especially groups 1, 4 and 5 considering the collecting and the selecting of waste and the protection of nature areas. They mentioned some characteristics of this 6th competence. However, this competence required further in-depth analysis because the successful functionaries admitted struggling with some competence-bottlenecks related to experiences with social sciences.

In attachment 9 the results of both the workshop and the interviews are put together to complete the concrete interpretation of this competence. During the interviews this competence, which should be able to address the bottlenecks for a lasting change process within society, was compared with planting, sowing a seed within the target persons, while preparing their brain to make it possible to germinate. It is not teaching, as it doesn't have the same characteristics. It contains some elements of coaching, though it is not only coaching. Before the coaching, the brain has to be prepared to enable

the change process. Just sowing competences is not enough to make them germinate. The ground, the roots have to be prepared, and this requires from the sustainability professionals a special competence.

For the final results, we call this competence 'Enable key competences to germinate within the target audience'. This competence overlaps with the teamwork and people management, the project management, decision making, evaluation and communication. Perhaps it is a certain gradation ('level 2'), enabling the competences for reproduction. Its main characteristics are:

- Fuelling inquisitiveness
- Stimulating responsibility
- Personal coaching
- Raising critical (self) analysis

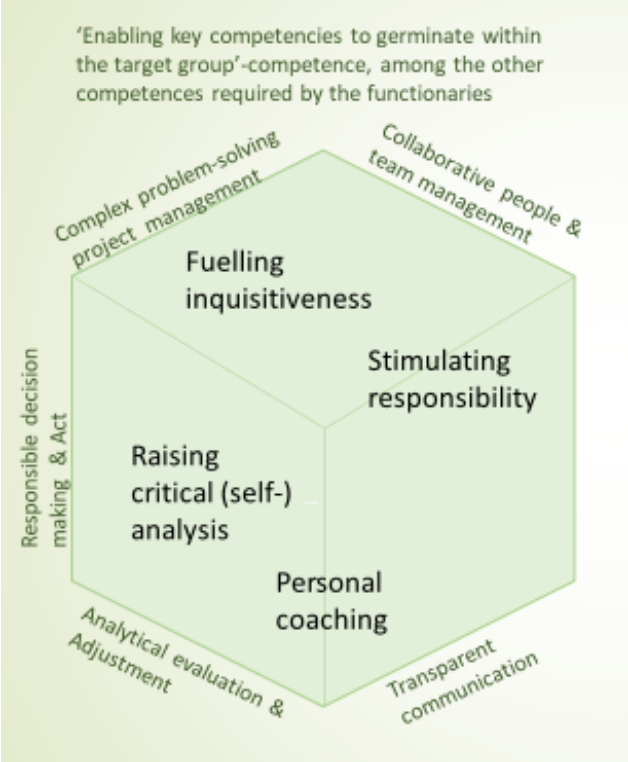

Figure 8a shows the interacting of 'fuelling inquisitiveness' with both the complex problem solving project management and the collaborative people and team management. Raising critical (self-) analysis requires similar skills and attitudes to make responsible decisions and to evaluate these decisions, while the personal coaching attitudes bring the transparent communication and the analytical evaluation & adjusting skills to another dimension.

Figure 8a: Schematic presentation of the results of the interviews: interpretation of the required competence to 'Enable key competences to germinate within the target groups' to tackle the bottlenecks for a self-purchasing lasting change process towards environmental sustainable behaviour in secondary school communities, and its overlapping sides in the competence-cluster.

In this regard, the results of the interviews provide both new knowledge about the interpretation of the 6th required competence which should tackle the bottlenecks, and insight in its interactions within the required competence-cluster resulting from the workshop. The results also shift the starting point within the required competence-cluster for change as presented in fig.6. Where the results of the workshop started with the complex environmental problem-solving project management, the interviewees accentuate the importance to firstly prepare the target audiences key competences for change through not missionizing and positive (re-)connection with nature (I1-I5), so that they can accept responsibility, willing to know more about environmental issues instead of getting tired or antagonistic to it. The aim of the first project becomes to prepare the target audience, to find out '**why'** they can't or don't want to change through a personal approach, and how to make them feel responsibility for the environment. The 'how to' change, then has to emerge in cooperation with the stakeholders.

The results of the interviews also provide the interpretation of which competences have to be enabled among the target audience, preferably during the secondary school trajectory (Fig.8b and table IVb).

Figure 8b: Key competences for change, required by the target audience of secondary school communities to enable a self-steering, lasting change process towards environmental sustainable behaviour.

Further observation of the curricula of the participating sustainability professionals, and the overlapping characteristics of the key competences required by the target audience with the practiced competences mentioned by the functionaries during the workshop (attachment 9), argues that the successful functionaries also possess these key competences. That's why these key competences are here (figure 8b) compared to a walnut, germinating into a tree containing the required key competences in its roots. Sustainability professionals develop these key competences into the required cluster for leading a change process towards environmental sustainable behaviour. To enable a lasting, self-steering change process within society, this tree (representing in first instance the sustainability functionary) has to sow its key competences while preparing the ground to let them germinate within the target groups. Then new trees (volunteers and early adopters) can rise, fostering a self-steering environmental sustainable behaviour among the citizens, multiplying the sustainable professionals within all kind of other professions, willing to develop their competences to become a sustainable professional, as described by Roorda & Rachelson (2018). There the personal coaching skills of sustainability professionals have to motivate those adopters to persist the change process while they continue developing their competences.

Finally, one interviewee mentioned the experienced strong effect of equine assisted training on the progress in the change process within his target audience, especially stimulating the accepting of responsibility and providing bounding opportunities among the laggards. Another respondent also practiced a kind of animal assisted learning by involving a standard work experience week on the farm in the curriculum for 14 year old students. The possible effect of animal assisted learning and nature related work experiences might be taken in account when practicing extant research on how to stimulate the accepting of responsibility, critical self-analysis, self-leadership and the bounding with nature and ecological systems.

5.5. Results (answer to research question)

In this section we present the final results. The competences resulting as an answer to the sub questions were judged by interpretation of the mutual similarities and differences and their meaning to the aimed change process in context. The answers on the sub questions led to an answer on the main question:

*Which **competences** do functionaries, employed as environmental sustainability professional, require to succeed in realising a lasting **change process** towards environmental sustainable behaviour in Belgian Flanders' society, through secondary school communities?*

From the data gathered from the workshop and the consequential in-depth interviews, we identify a cluster of six overlapping and spirally interacting competences. These are built around, or emerging from basic skills, which should also be achieved within the target audience. To enable a lasting change process towards environmental sustainable behaviour within society, the sustainability functionaries require a cluster of six overlapping competences, which are presented in figure 9. They are:

- *'Collaborative people & team management',*
- *'Complex environmental problem-solving project management',*
- *'Responsible decision making & action skills',*
- *'Analytical evaluation & adjusting skills',*
- *'Transparent communication about problem, process and decisions' and*
- *'Enable key competences to germinate within the target audience'*

This last competence provides new insight in the competence to tackle the competence-bottlenecks for a lasting change process. Facing the experienced bottlenecks for a sustainable change process within society, the succeeding sustainability professionals and their team have to reach a certain competence level, by iterative (self-) evaluation and adjusting. Figure 9 also shows this spirally constructed process.

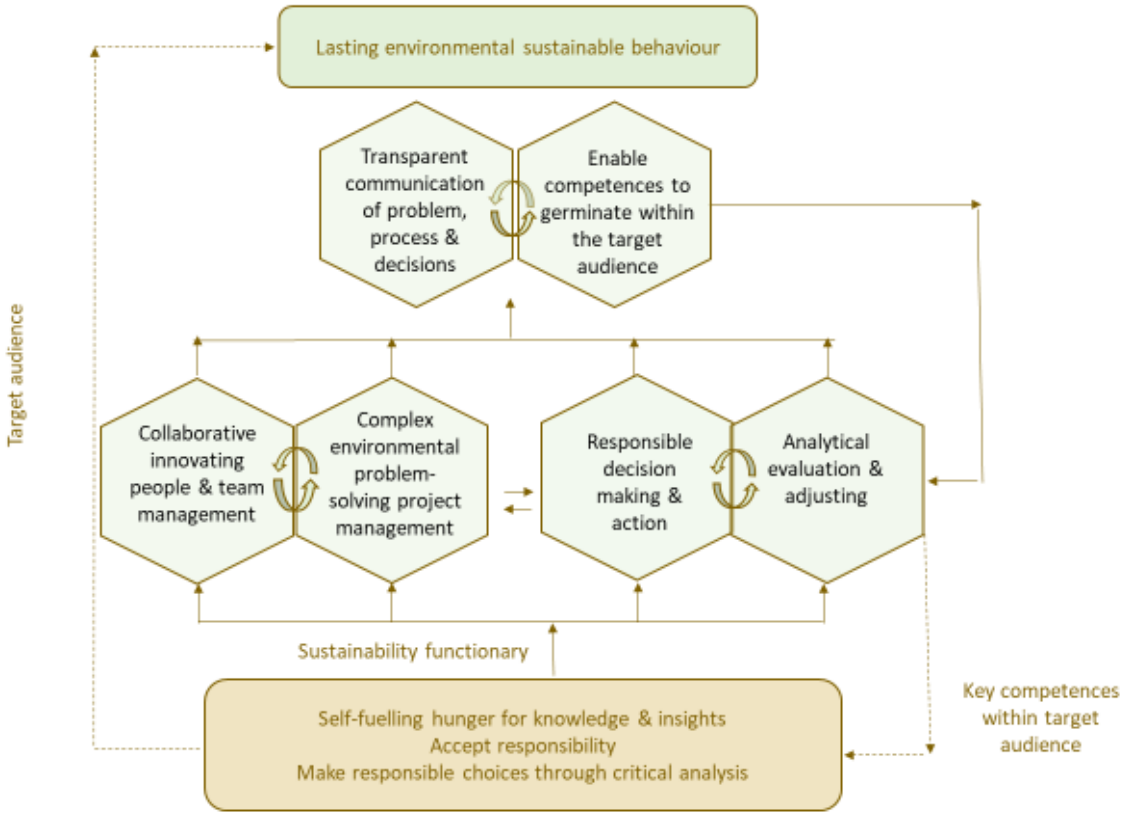

Figure 9: Competences of functionaries (shown in hexagons), employed as environmental sustainability professional in Belgian Flanders, to succeed in realising a self-steering, lasting change process towards environmental sustainable behaviour within society, related to the key competences required by their target audience of secondary school communities. Basic competence-characteristics (bottom) drive the professionals to develop the required cluster of six competences, represented as interacting hexagons. These are spirally forming the consistent cluster, reaching through analytical evaluation and adjustment the required levels of competence to develop the basic competences within the target audience (----), which make the lasting change process possible.

Basic competences drive the professionals to want to realise the targeted behaviour change process within society, and enable them to develop the required cluster of six competences to succeed. These basic competences for change include ‘accept responsibility’, ‘a self-fueling hunger for more knowledge and insights, including system thinking’, and being aware of ‘making own choices through critical (self-) analysis’. During the workshop the ‘passion for their job’ was mentioned by all groups. The curricula of the successful environmental sustainability professionals confirm that they are lifelong students, interested in different disciplines, eager to learn. During the workshop they were self-critical, able to admit their own weaknesses (table III). Most of them take responsibilities in various fields besides their job. Then their more complex competences, required to drive a sustainable change process within society, are developed into a spirally overlapping construction.

Collaborative innovating people & team management

System thinking and a self-fuelling hunger for more insight regarding planet and people, are basic characteristics of the more complex competences to ‘manage the target audience and the own team in collaborative way’ and to ‘manage complex environmental problem-solving projects’, which are practiced by the sustainability professionals simultaneously in an interactive way. To accomplish problem solving projects in collaboration with the own team and with the target audience, the sustainability professionals firstly have to map all stakeholders, their (and own) values, cultures, ethics, find out why they shouldn’t change, detect the needs behind the needs, the problems and conflicts and what they want for compensation. The professionals realise the importance of co-creation and co-ownership of the project. They respect other values, think collectively while politically neutral, willing to infiltrate the target group to feel and show empathy, listening and stimulating bottom-up inspiration, granting the honour to the stakeholders. They have to find a personal link, sharing knowledge, experience and good examples. They are driven, combative, persevering, while being open for discussion and involving local experts in a transdisciplinary team. The concrete interpretation of the six required competences, as mentioned by the participants, is detailed in attachment 9.

Complex environmental problem-solving project management

The project management has to be practiced simultaneously and iteratively with the collaborative innovating people & team management. The project has to be managed in collaboration with all stakeholders, for bottom-up implication of possible solutions. The professionals emphasise the importance of co-creation and co-ownership of the project, granting the honour to the stakeholders. The collaborative environmental problem-solving project management, requires the professionals to know what they’re talking about. Showing real-live experiences, good examples in time and space, and knowing all possible solutions while thinking economically, weighing costs, time and effort asked to stakeholders, are required skills for both the people and project management. The competence to manage projects solving complex environmental problems also include insight in present, past and future situation based on studies and examples. The professionals have insight in the whole environmental system and what the system can bear, zooming in and out in time and space, while taking account of non-linear processes, political strategies and political structures.

Responsible decision making & action

Accepting responsibility is the drive willing to save the planet and to hold on despite the encountered bottlenecks, and the ability of making responsible choices enables the developing of the competence to ‘make responsible decisions and take action’. Other characteristics of this competence are expertise and scientific knowledge, insight in different perspectives in times scales, insight in the consequences of the decision and in the necessity of intervention. The functionary has to be able to find win-win agreements for both the stakeholders and the environment, to minimise the negative impact and to take the initiative to decide for effective action, in peace with his own values and ethics, holding focus on the aim and reason of the project. This ‘responsible decision making and action’ is continuously practiced during the process of both project-management and stakeholder- or team management. Power relations and conflicts between stakeholders require skills for anticipating conflicts and the ability to negotiate. This was also concluded by Perez Salgado et al. (2018) and Roorda & Rachelson (2018). Every decision and action has to be evaluated and adjusted in function of reaching the initial goal of behaviour change. This competence is therefore in continued interaction with the competence concerning ‘Analytical evaluation and adjusting’.

Analytical evaluation & adjusting

This competence includes the skills to react adequately in time, space and attitude, the ability to measure the behaviour change and to analyse the change in the ecological system, while estimating the situation without prejudices. The functionary has to be self-reflective and critical, learning from

feedback and other's experience. The developing of the 'Analytical evaluation and adjusting' competence is driven from the elementary attitude of critical (self-) analysis.

'Transparent communication about problem, process and decisions'

This competence overlaps with all previous competences, keeping the message rolling towards all stakeholders, including the own team, and vice versa through feedback. Some characteristics of this competence are the ability to translate complexity and explain the problem in an understandable way, to use connective communication strategies while being a trustable person. The functionary has to be open and honest, differentiating between fact and opinion. The competence for transparent communication is iteratively interacting with the competence to 'Enable competences for change to germinate within the target audience'.

Enable competences for change to germinate within the target audience

All competences are somehow spirally constructed and interacting to enable the change process. The 6th competence is also reflecting to the aim of each project. During the workshop it was obvious that this competence rises from the (self-) critical evaluation of the impact of decisions and actions on behaviour change (people) and on the environment (project), in interaction with the feedback rising from transparent communication. Where the analytical evaluation or the feedback from transparent communication is lacking, the bottlenecks remain vailed and thus are difficult to overcome.

This sixth competence is resulting as an indispensable competence to enable the target audience to accept, support and participate in the necessary change processes, which is, according to Barth et.al (2007), a prerequisite to make change possible. Personal coaching, leading people to autonomy of choices by raising critical (self-) analysis, and stimulating both inquisitiveness and responsibility, are its main characteristics (see fig. 8). This competence should help to tackle some bottlenecks such as 'lack of people taking responsibility', 'don't accept critics', 'lobby of business' and 'tiredness of target group after a while'. All interviewees mentioned characteristics of this competence, and all of them also argued the importance to prepare the target audience stimulating their required competences for change. If this becomes part of the goal of the projects, more tools and resources should go to find time for personal contact, to form the own team and volunteers, to evaluation, while the project should be more than a hype requiring endless repetitive actions, which were part of the experienced bottlenecks. The advantage of practicing characteristics of this competence was also experienced by groups 1 and 4 concerning the reached change process for bringing sorted waste to recycling parcs, for using renewable energy and for respecting nature areas for example. To enable competences for change to germinate within the target audience, the functionaries have to be able to think in different time scales. They have to share or give the ownership, to lead people to autonomy of choices. They connect like-minded people and connect people with nature, while holding focus on the reason of action. They have to know their own roles, the impact of their own experiences on their own choices and behaviour, and the principles of leadership and coaching for change. A detailed interpretation of this competence is described in table IVa, and summarized in attachment 9. According to the interviewees, experienced with both environmental and change processes using social sciences, the characteristics of this competence are required to overcome also the experienced bottlenecks related to other persons, such as 'consumer based society', 'difficult decision making of politicians' and to deal with 'conflicting interests', if the necessary key competences (accepting responsibility, system thinking, hunger for knowledge about people and planet and critical analysis) would be learned in secondary schools (see 5.4.2. relation to the bottlenecks).

Finally, to enable a lasting, deep rooted change process towards environmental sustainable behaviour, the sustainability professionals have to be able to act without ego. The egoistic value works against sustainable behaviour (Whitley, Takahashi, Zwickle, Besley & Lertpratchya, 2016). The successful environmental sustainability functionaries had to share their experiences, ownership and competences through a personal approach within both their team and target audience. They have to

be transparent, self-critical and trustable, without missionizing, though emphasising the urgency honestly and critically. Being careful to avoid thinking in boxes, not playing the game of winners and losers, they focus on win-win for both the stakeholders and nature. They have to search for examples in time and space continuously and fuel inquisitiveness to all possible solutions within their target group. They do this preferably without coercion, taking in account what the target audience can bear, while empowering the stakeholders' personal strength. The whole team has to feel personal involvement with nature, and transfer this connected feeling within the target group. They have to find the balance between patient and perseverant, between listening and taking directive decisions, switching fluently between their roles as empathizing spectator, trusted advisor, and also as guardian of the environment in the role of a policy and decision maker, in agreement with Runhaar et. al (2006). The attitudes of the sustainability professionals are very important to motivate the target audience for connecting with nature and environment, driving their hunger for knowledge and responsibilities in that direction. These, sometimes conflicting roles and attitudes are important to enable the cluster of competences rolling softly without harming the ground, flexibly adapted to the values and personal needs for growth of the target audience, in harmony with the environment.

To reach a self-steering, lasting change proces, the functionary practices the competences in the role of 'super-leader' (Manz & Sims, 1991), leading the project team and the stakeholders to lead themselves, where the project is based on shared ownership and where peoples' strengths are developed.

Spirally constructed and dimensions in time and space

When practiced simultaneously and iteratively, spirally overlapping, the competences show a certain growth towards a top degree, represented by the top of each hexagon (fig. 10). The competences of the sustainability professionals are growing, due to their own experiences and sharing experiences among the team during their career. Both the importance of "maturity" and "experience", and the "spiral process" are also reported in the conclusions of Perez Salgado et. al (2018). This emphasises the importance of both the own experience and the learning from senior professionals sharing their experiences with the (transboundary) team.

Figure 10: Construction of competences when practiced simultaneously and iteratively

In attachment 9 is shown how each competence contains a dimension of time and space, similar to the findings of Roorda and Rachelson (2018) in their 'time oriented' and 'space oriented' competences required by professionals wanting to behave in a sustainable way within their own job. Here, these time and space orientation occur almost everywhere in the cluster. Because driving behaviour change within a target audience requires time, and also knowledge and insights in time and space, the sustainable change process is slowed down or maybe impossible if the functionaries reach these insights and competences only at the end of their career. To enhance the targeted change process on short term, transdisciplinary teamwork in time (younger and senior professionals together) and space (crossing boundaries of countries and disciplines) will be necessary for this transmission of competences among both environmental sustainability functionaries and their target groups. If the professional has not reached yet the complete competence cluster at the required level, he has to search for the complementary competences and adequate experience within his team, learning from experiences of others (Manz & Sims, 1991).

Additional result: Competences required by the target audience

An important result is that change does not occur by simply sowing seeds through nature and sustainability education among the target group. The seeds are in fig. 8b represented by a walnut. If the seeds fall on a rock, change won't happen. This rock can also be constructed by the target person if he feels attacked in his personality (Peters, 2018; Stokness, 2017). The cluster of competences, required by the functionaries, therefore mainly has to prepare the ground, allowing the brains of the target audience to make that knowledge germinate by forming strong roots of key competences (I1,I2,I4,I5). To reach also the late followers, and also to bridge the hypes and realise a self-steering, lasting change process among the early followers, the target audience first has to achieve following key competences for (re-)connection with nature:

- accepting responsibility,
- a self-fuelling hunger for knowledge and insights,
- system thinking, and
- be aware of own choices and autonomy through critical analysis.

These basic competences are similar to the initial basic competences driving the sustainability professionals to want to keep a healthy planet and to develop the cluster of competences to drive a change process (fig.9). To achieve a lasting change process, the first projects should have the aim to enable these competences to germinate within the target groups. Where the seed can germinate, the stakeholders can empathize with the problem through *system thinking* and *take their responsibility* through a feeling of shared ownership with both nature and the project to protect it. Then new adopters appear and the next project should emerge from choices of possible solutions discussed among the stakeholders. This bottom-up effect is important for a self-steering change process.

Roorda and Rachelson (2018) also mention 'Accepting personal Responsibility' as the first required competence to become a sustainable professional in all kind of professions, followed by 'empathy' and 'systems orienting', which here are represented by system thinking driven through *a self-fuelling hunger for more knowledge and insights into both environment and people*. *Being aware of your own choices* is one of Roorda and Rachelsons 'Action skills' making it possible to make responsible decisions. Luken (2008) explains the skills to accept responsibility, to make responsible choices and the self-steering hunger for study in relation to the stadia of ego-developing during the adolescence, and the observation that not all adults reach the state of self-awareness, while others can reach it at the age of 13 or 14, during the early adolescence. Only few people reach the state of great responsibility and self-chosen long-term goals.

Ideally, these key competences should be acquired during the school trajectory. This already happens successfully during the primary school trajectory, as long as the pupils follow the choices of their exampling parents and teachers. In contrary, during the secondary school trajectory, when the target group starts to make its own choices, it seems difficult to resist to the actual overarching lobby and disinformation, and an aversion to the knowledge concerning, or even an antagonistic attitude towards environmental sustainability items can occur. The study of Boeve-de-Pauw & Van Petegem (2013), confirms this statement, mentioned by the participants during both the workshop and the interviews. This emphasises the importance to enable these basic key competences to germinate within the target audience of secondary school communities, to enhance the change process within society. If their key competences can grow both strong enough to enable a sustainable behaviour change, and flexible enough to resist to the wind of lobby and other bottlenecks, they can become volunteers or new sustainable professionals spreading the seeds and preparing the ground for other target groups. Then the functionaries can put more energy in coaching, to maintain a self-steering, lasting change process, reaching also the late followers.

6. Conclusions and Discussion

6.1. Conclusions

This thesis contributes to the field of sustainability science by presenting empirical results and insights regarding competences required by environmental sustainability functionaries, including the required competences to overcome the experienced bottlenecks, when realising a change process towards environmental sustainable behaviour in Belgian Flanders. The qualitative empirical results of this research are based on an action research workshop with experienced senior professionals, and on interviews.

The **first sub question** distilled from the literature delivered a broad spectre of competences, and elements of competences. The results (table I) illustrated the complexity in perspectives. These results were the guide for coding the data of the workshop, in order to compare the answers of the professionals with earlier scientific research.

The participants for the workshop and the interviews were carefully selected following the answers to the **sub question 2**, namely senior functionaries experienced with successful change processes towards environmental sustainable behaviour within their target groups in Belgian Flanders.

It is remarkable that all (elements of) competences found in the broad literature review, were also mentioned in a comparable sense by the participants of the workshop, in answer on the **sub question 3A**. The complexity of interacting (elements of) multiple competences and the different language, could lead to minor doubt in some cases. For that reason, the participants were asked for feedback.

Five main competences were being obviously practiced by the experienced functionaries, enabling change processes when practiced simultaneously and iteratively:

- *'Collaborative people & team management',*
- *'Complex environmental problem-solving project management',*
- *'Responsible decision making & action skills',*
- *'Analytical evaluation & adjusting skills',*
- *'Transparent communication about problem, process and decisions'*

Due to mutual peer evaluation during the convergent phase of the workshop, elements of a 6th practiced competence appeared among the groups, leading to a lasting or self-steering change process, reaching also the late followers, which we finally labelled as the competence to:

- *'Enable competences to germinate within the target audience'.*

The full interpretation of this competence required in-depth exploration, because there were still many bottlenecks to tackle before reaching this aimed 'second level', driving a lasting, self-steering change process, as mentioned by the participants.

The context wherein the functionaries practiced their competences, was broader than the secondary school communities. This was interesting, considering the evaluation of behaviour change on long term, which doesn't happen currently in the secondary school communities. The workshop delivered also a clear answer on the **sub question 3B** concerning the encountered bottlenecks for change towards environmental sustainable behaviour (table III). These bottlenecks were a guide for the questions of the interviews. The interviews delivered a wide range of data. However, by closer analysis all interviewees mentioned elements belonging to a similar line, with similar insights. These insights could give a full interpretation to the 6th required competence, namely to tackle some main bottlenecks linked to Belgian Flanders' secondary school communities, in answer on the **sub question 3C.** Moreover, the interviews opened new insights, grounded in experiences of practitioners

of social sciences related to behaviour change, which were an answer to the remaining questions of the functionaries during the workshop.

In-depth exploration of the incomplete or missing competence to realise a self-steering, lasting change process lead to the interpretation and significance of the 'Enabling key competences for change to germinate within the target audience' competence. The exploration of the encountered bottlenecks related to the practiced competences of experienced and successful (senior) functionaries represents hereby a significant advance on previous conceptualisations of the competences required by sustainability professionals for change. Recognising the limitation of their knowledge and experiences with social sciences to overcome the bottlenecks for a lasting change process, which they call 'the level 2', namely a self-steering and lasting change process reaching unto the late followers, led to a specific well-focussed selection of the participants for the in-depth interviews. The results of the interviews delivered insights into the possible prevention and overcoming of the persisting bottlenecks, which seemed not to have been identified in the consulted earlier research regarding competences for change towards sustainable behaviour.

The **method** delivered a large amount of data in a short period, which are grounded in experiences of successful professionals, while the back-casting enabled long term evaluations concerning the impact on behaviour change. Mutual evaluation of the competences and the bottlenecks appearing during the workshop, encouraged the participants towards a self-critical analysis of competence related bottlenecks. This mutual peer evaluation of the professionals working on different domains of environmental sustainability led to a rather frustrating, but important conclusion that most of the realised change processes were not lasting, requiring a continued input of energy and time, which was considered as an important bottleneck, maybe related to a lack of experiences with social sciences. Therefore the second part of this qualitative research got a little different turn: the focus for the interviews had to be overarching both the context of secondary school communities and the social sciences related competences for change.

The resulting competences of the different sub questions give an **answer on the main question**, namely providing the cluster of competences required by functionaries, employed as environmental sustainability professional, to succeed in realising a (lasting) change process towards environmental sustainable behaviour in Belgian Flanders' society. The results are not exclusively regarding the target group of secondary school communities, because most of the participants had experience with realising a change process within both secondary school communities and other target groups. However, the resulting competences were evaluated regarding their consequential validity relating to practice in secondary schools, taking to account the characteristics of, and bottlenecks encountered in, or in relationship to the secondary school communities, as mentioned by the participants.

An additional result provides also knowledge and insights regarding the competences required by the target audience, and the correlation of these with the required competences of the sustainability professionals, due to the insight that some core bottlenecks for change can be overcome when the basic conditions for a change process are reached by the target audience. To enable change within society, those required key competences should be developed during the secondary school trajectory, forming sustainable professionals such as craftsmen in all sectors, including the secondary school communities. Stagell, Almers, Askerlund & Apelqvist (2014) also reported that the approach of addressing students moral responsibility in the private sphere, and proposing all possible solutions as a norm to help students make responsible choices, still has to be performed, even in eco-schools. The narrative research of Almers (2013) also claims the crucial importance of interaction between the formal educational context and the informal context of youth, to develop sustainable behaviour.

The results on this main question include insights showing an emerging nuance of the main question, due to the conclusion that

- A specific clustered level of the professional competences is required to realise a **self-steering, lasting** change process towards environmental sustainable behaviour.

- The competences, required by the sustainability professionals are also related, fuelled or limited by the **competences required by the target group**.
- **To overcome the experienced bottlenecks**, both the target audience and the sustainability professionals require a well-prepared soil of key competences to make a change process possible.
- This soil, enabling the germination of key competences for a lasting change process towards environmental sustainable behaviour within society, should be prepared **through** the trajectory of secondary school, **with** the transdisciplinary team of the school community and the environmental sustainability professionals, including teachers.
- Then more seeds, sown by the environmental sustainability professionals, can germinate into more volunteers, more sustainable professionals and politicians, resulting in more time for the professionals to personal coaching and connect to problem-solving projects where necessary.

6.2. Reflection on validity, reliability and ethical aspects

The quality and the choice of the methods have an impact on the validity and reliability of the research, as detailed under paragraph 4.2.6. Here we reflect on these aspects during the research process and the obtained results. At the end we give some suggestions for further research.

Internal validity

Validation has been an active part of the research process, through triangulation in each part, audit trail and negative case (bottlenecks) exploration:

- The selection of participants is based on collected documents and recommendation of professionals, recognized as the driving force leading cases where sustainable behaviour change appeared in Belgian Flanders. Since the results of using competences are measurable, as is the intended sustainable change, these senior, experienced participants are an appropriate choice to determine the preconditions for success, considering the consequential validity of their practiced competences in relation to these identified successful cases (Luken, T., 2008).
- According to Schmidt & Hunter (1998) considering identified lasting success cases over a long period (senior professionals) in combination with personal interviews, improves the score of validity to high and very high in terms of evaluating competences.
- The professionals of all groups were selected for the workshop because they had realised a change process. However, not all of them could prove the change process reaching late followers (criteria for sustainable, self- supporting change process). The participants of groups 2 and 3 have realised successful actions, with a great number of participants to their actions, but the change process towards behaviour change was not measured, due to the bottlenecks related to evaluation. The average age of group 3 is also younger. These identified differences in experience with effective successful change processes among the groups, enabled to distil the differences in interpretation of the required competences for evaluation, and confirm the added value of the senior professionals facing the frustration of persisting bottlenecks on long term, even when a successful effective change process was measured.
- The strength of triangulation of individuals: by interviewing different respondents from those of the workshop, the answers are validated from various angles. The 5 interviewees mentioned different elements of competences running a parallel line (at.8B).
- To increase internal validity, the interviews were recorded and written out in a report with the sentences literally written before coding in comparison to competences mentioned in earlier scientific research.
- The resulting competences are grounded in the collected data, namely the view of the participants through a constructivist approach, and the consequential validity of the competences, which led to identified change processes.

External validity

The external validity depends on the possible generalisation of the results to other similar cases.

- The research population involved for this study was 25 participants. A careful selection of respondents attempted to compile a generic group of experts, practising their competences in different domains and within different regions of Belgian Flanders. Respondents familiar with the social sciences related to behaviour change in a broader context, made it possible to generalise the results to comparable contexts in relation to sustainable behaviour change. The inclusion of teachers of different school communities and environmental functionaries with a wide range of target groups, expands the possible generalisation to other target groups. The resulting competences required by the target audience might also be valid in other contexts where competences for behaviour change are required. Respondents mention the possible generalisation of the results for helping people to resist to other temptations due to the current abundant availability of other harming temptations such as smoking, alcohol consumption and drugs, and the increasing disinformation through social media.
- The empirical exploration of practiced competences by experienced and successful professionals working with different target groups and on different domains of environmental sustainability in Belgian Flanders, happened through a participatory action research consisting of a workshop and individual personal interviews in iterative confrontation to literature review. The workshop was coordinated by three researchers, experienced in different disciplines connected to the research item of behaviour change towards environmental sustainable behaviour.
- The comparison to the results obtained through the literature review also increases the external validity because the results of the participatory research are hereby also evaluated and structured on the basis of previous research concerning competences and their dimensions in other countries or in other contexts, and by other scientists.
- This triangulation of individuals, data and methods enhance both the accuracy and validity (Verhoeven, 2011). Moreover, the final results can be considered as following a similar line as identified in other recent research, with exception of the added values.

Internal reliability and accuracy

During the divergence phase of the workshop the different participants were divided into groups with similar target audience and a similarity in their successful results, because there was a risk that their answers show differences: not all participants reached the same level of success or have the same interpretation of success, relating to behaviour change. For the teachers for example, no measuring or evaluation of behaviour change was found on longer time scale, while the municipal sustainability professionals have to send the measured evolution every year to get approval and grants (WVI, 2005). This deliberate breeding of the groups, followed by mutual reflection during the plenary convergence phase of the workshop, enhances the internal reliability.

The workshop was led by three scientists. One researcher analysed the provided data. The practiced methods and intermediating steps leading to conclusion are added in attachments. The two other researchers read the results and conclusions and the results of the workshop were sent to all participants for feedback. All participants agreed with the resulting elements of their practiced competences, and the used terminology, which was fitted with the terminology of previous research. This triangulation of individuals enhances the accuracy of the data.

The interviews are performed by one interviewer, the advantage being that a consistent interview procedure is applied to all the respondents. The interview manual is added in attachment 6. The five selected interviewees revealed a lot of knowledge and insights, mutually confirmed in other words by all interviewees, as shown in table IV. In the event that this research is to be conducted by someone else, the semi-structured interviews should provide the same results on the basis of the respondents' answers, if the interviews are conducted with the same questions to the same group of interviewees.

To increase internal reliability (and accuracy), the questions and answers of the interviews were recorded and written down literally before coding, enabling other researchers to confirm the resulting knowledge and insights regarding the required competences and their interrelations.

The final results were also sent to all participants for feedback. We obtained three comments, which were included in the final results.

External reliability

- The selection of participants, based on different experience with success-cases (different years of experience and different degree of success-cases, expanded to transdisciplinary experiences of behaviour change through the interviews), has the advantage that the resulting competences have a high reliability towards a successful process of environmental sustainable behaviour change.
- Although the aimed behaviour change is not identified by all participants' target groups and not all participants have at least 20 years of experience, these sub-groups of (mainly younger) participants still represent a group of functionaries dealing with sustainability-education in Belgian Flanders. By involving these participants in separate sub-groups the mutual differences of provided data among the experienced professionals could be traced to enhance the accuracy and generalization of the results.
- The interviews involved experienced participants dealing with sustainable behaviour change both in general and related to environmental sustainable behaviour. This transboundary triangulation of individuals (spectrum of time of experience, degree of success and spectrum of target groups related to secondary school communities) enhances the possible reproductivity of the results in further similar research relating to competences for a self-steering and lasting change process towards environmental sustainable behaviour within society.

Ethical aspects

- The results do not contain the names of participants. All the results for publication are anonymized so that they can't be recognised at a personal level. The attachments are separated into public attachments and confidential information. The confidential information is not put into attachment to this research. The participants were asked permission to write their full names in the internal documents.
- Participation in the workshop and interviews is on a voluntary basis. There is no hierarchical relation between the participants and the researcher. Respondents could withdraw from the study without giving a reason.
- The research is conducted for a master thesis. This excludes the investigation from any commercial interest that may influence findings made during the investigation.

6.3. Discussion and recommendations

Relevance of the results

This participative action research contributes to process oriented knowledge production by cooperation of professional expert experiences with scientists. The scientific relevance lies in the added value of a cluster of required competences, grounded in successful experiences where a change process effectively occurred. Through dialogue and co-creating knowledge, new process oriented knowledge and insights were generated about both the required competences and how to tackle the encountered bottlenecks. The results lead to a refined interpretation of competences, the order in which they are practiced, their interrelations and their effects on behaviour change. The insight that a lasting self-steering change process requires supplementary competences of both the professionals and the target group, resulted from the transdisciplinary approach of this research and from the experienced bottlenecks for change.

The knowledge can be useful to enhance or speed up change processes towards environmental sustainable behaviour within society. The resulting cluster of competences practiced by individual successful sustainability functionaries, including teachers, realizing a change process towards environmental sustainable behaviour in Belgian Flanders, has not been explored previously by empirical scientific research. In-depth exploration of the required competences to realise a self-steering, lasting change process, led to the interpretation and significance of the competence to 'Enable key competences for change to germinate within the target audience', and the key competences required by the target audience. This represents a significant advance on previous conceptualisations of the competences required by sustainability professionals.

The resulting cluster of competences is relevant to society by cooperation of expert experiences to scientific research. Functionaries are a specific group of sustainability professionals, experienced in dealing with a wide range of target groups and stakeholders, such as politicians, managers, craftsmen in various professional branches, including the audience of secondary school communities. They are pivoting between the legislation makers and society. Their competences can make a crucial difference to enhance the aimed change process within society. Most experienced senior environmental functionaries had to learn these competences for a great part on the job, often helped by multiple interdisciplinary training and many years of transboundary cooperation. The required competences can be used as a guide for evaluating new (teams of) functionaries entrusted with the same tasks, or to find the complementary team members required in existing teams.

The workshop was a perfect example of informal learning through co-creation of knowledge and insights, through learning from mutual experiences and feedback. The supplementary knowledge about the required competences by the target audience will be useful to enhance or faster further change processes towards environmental sustainable behaviour within society.

The main question focused on a change process within the target group of secondary school communities. The qualitative exploration lead to a broader context due to the interdisciplinarity of the successful professionals. The resulting competences are relevant in the context of secondary school communities, though from another point of view: the key competences should be prepared to germinate during the secondary school trajectory.

The key competences leading to deliberative choosing capacities, are important not only to enhance a change process towards environmental sustainable behaviour. These skills are also the foundation of our democracy, where citizens choose for their political leaders and their programmes. If citizens prefer, or take it as normal again that others choose for them, because making choices has become so difficult nowadays in the consumption based society, this might also threaten our democratic system.

The relevance of this research also extends to the researcher(s) and the participants. The main researcher improved experiences with qualitative research methods. This study stimulated a certain growth in practicing new research methods. Moreover, however the researcher herself had experiences as an environmental sustainability functionary, plenty of new priceless insights emerged from both the workshop, the interviews and the literature review. Finally, as this research was performed in English, the researcher could also benefit from a serious improvement in language skills.

Relation to previous research

The resulting competences are both in the line of the dimensions of the 'intervention competence', as identified by Perez Salgado et. al (2018), and the 'seven competences of the sustainable professional', as defined by Roorda & Rachelson (2018): Cope with complexity and political strategic thinking (Perez Salgado et. al, 2018) is a dimension comparable to elements of our 'complex environmental problem solving project management'. 'Show goal oriented adequate action' and 'reaching decisions connected to motivation to act' have the same characteristics as our competence to 'Make responsible decisions and take action', while the characteristics of their 'translate

stakeholder diversity into collectively produced interventions' and 'Adopt and communicate ethical practices' – competences are recognisable in our 'Collaborative team & people management'.

However, the selection of senior professionals, having experiences with successful processes of behaviour change while facing the encountered bottlenecks through critical analysis of the impact of their actions on both behaviour change and the environment on a longer time scale, delivered new insights concerning the importance of the 'Analytical evaluation and adjustment skills' to unveil the persisting bottlenecks. Perez Salgado et. al (2018) also mentioned the importance of "maturity" and "experience" in their conclusions. The experiences of our senior functionaries and the exploring of their encountered bottlenecks led to important additional required competences for change, and the involving of professionals experienced with social sciences delivered new insight in the interpretation of these additional competences and their overlapping interrelations. Roorda & Rachelsons (2018) 'Responsibility' and 'Emotional intelligence' are here recognized as the key competences required by the target audience, and driving the functionaries to enable change processes towards sustainable behaviour. The characteristics of their 'System orientation' and 'Future orientation' are included in our 'complex environmental problem solving project management', while the characteristics of their 'Involvement' – competence make part of both our 'Collaborative team & people management' and the competence to 'Enable competences to germinate'. The 'Action skills' of Roorda & Rachelson are very recognisable in our 'Decision making and action skills'. The sustainability professionals are of course also firstly sustainable professionals as described by Roorda & Rachelson'. However, their competences have to reach further than changing their own behaviour within their job, which enhances the complexity of the required competences and their interrelations. Where Roorda and Rachelson consider 'leadership' to be a competence-level, our study approves the same conclusion in the respect of considering the characteristics of super-leadership (Manz & Sims, 1991) for change in our competence to 'enable competences to germinate'-competence, which brings the whole competence cluster to a 'higher level', as quoted by the participants.

Comparing the individual elements of the resulting competences, as presented in attachment 9, with the quantitative survey of sustainability professionals conducted by Willard et. al (2010) is also relevant. Where the "Problem solving" is rated as the 'top skill' by Willard et al, here the 'Complex environmental problem solving project management' competence represents only one part of the required complex competence cluster. The characteristics of 'strategic thinking' and 'interpersonal collaboration' competences as mentioned by Wiek et al. (2011), are also recognized in the interpretation of our interacting 'Complex environmental problem solving project management' and 'Collaborative people or team management' competences.

The study of Hesselbarth & Schaltegger (2014, tableI p. 27 & table VI p. 31) includes the same competence dimensions for project and people management competences in interaction with the decision making, practiced in the master training for sustainability management. They mention personal skills for self-management and self-learning abilities, which are comparable to forelaying key competences in our study. The results confirm the contribution of educational sciences (involving teachers) to sustainability sciences, especially related to individual action and behaviour change and social learning, as recommended by Barth & Michelsen (2012).

Finally the process of this research highlights the importance of involving experienced and successful practitioners, of system thinking and generating insights through complexity, taking into account the encountered bottlenecks for change, which mainly occur by a critical (self-)analysis of the professionals having perspective in time and space.

The main bottleneck for this study was to converge the large amount of interacting data and new insight into defined competences. The differing terminology in the majority of contributions and the variety of existing frameworks that are not related to a common core concept in the context and perspective of this study, made it not easy to find the adequate terminology for the required overlapping competences. The practice-oriented check list for self-testing, as included in Roorda & Rachelsons 'Seven competences of the sustainable professional' (2018) should be adapted to this

complex interacting cluster of competences for self- or peer evaluation among other experienced and successful environmental sustainability functionaries, to see if they agree. Further literature review about change processes related to social sciences might lead to more adequate terminology.

Relevance of the used method

The method delivered many data and insights in a short period, thanks to back-casting techniques, dialogue and co-creation. Dialogue was essential to discover the practiced elements of competences and their interrelations, and for a fuller understanding of these elements and the encountered bottlenecks. A survey, even with open questions, would have been too restrictive to deliver the required insights in this complexity. Participants as well as the researchers needed supplementary questions for deeper understanding of the interacting competences, the experienced bottlenecks, how to overcome these bottlenecks and the impact on behaviour change. The workshop created the opportunity for the participants, to co-create new insights based on their own life experiences, through mutual reflection, whose added value was also experienced by Perez Salgado et al. (2018). The transboundary approach, also in the literature review, consisting of both scientific documents relating to sustainability and social sciences including management practices and experiences related to change processes in other disciplines, opened a broader view on the ongoing bottlenecks while offering informal confirmation of the resulting competence-related solutions. The different perspectives of the interviews did not make it easy to simplify the data into a frame, moreover that similar competences were not found in previous scientific research about competences of sustainability professionals. However, the added value of these different perspectives was obvious when the answers appeared to follow similar lines leading to the same insights. The complexity of the bottlenecks required a complex transboundary interaction of possible solutions. In order for further similar explorative research, the same triangulation of data, methods and individuals would be used despite the encountered difficulties for coding.

Recommendations for secondary school communities

Functionaries should train the actors of secondary school communities to get the key competences prepared to germinate within the students during the secondary school trajectory. An interdisciplinary (teachers and staff in different disciplines) and trans disciplinary approach (simultaneously in non-educational, private context) is namely required, complementary to the interventions of the experienced environmental sustainability functionaries. Further research in successful school communities in Belgian Flanders or in other countries, can deliver more information about how to manage and evaluate the development of these key competences. An experimental research could explore the impact on the aimed change process on relative short term in Belgian Flanders. Another possible approach in the short term could be the approach recently adopted in Northern France, where the environmental sustainability functionaries are coaching a certain target audience within the secondary school community, by a personal approach and follow up during at least one year. This personal approach and follow up of key competences is also practiced in some secondary school following the Steiner or Waldorf philosophy, where the personal evaluation is continued during the whole school trajectory, through a wholistic approach including the choices and behaviour in non-educational context by closely involving the parents. There further studies might possibly prove the self-steering lasting sustainable behaviour in further life as a sustainable professional and citizen for example, exploring the impact of this approach during the secondary school trajectory.

Recommendations for further research

The results suggest the following possibilities for future research.
Further research is recommended on a method to provide guidance on how to learn and practice the resulting cluster of competences, and to measure the effect on the change process, when the required completed cluster of competences is practiced by new professionals. Taking account of the necessity of action for behaviour change on very short term, empirical action research with

participation of target groups, are recommended to be the most appropriate. The methods might include narratives to describe the internal interrelations.

Further research could focus on real-world practice of the acquired scientific knowledge and insights, maybe in relation to the required change process for possible climate change adaptation. A practical user-friendly check-list of the required competence-elements should make it easier for use in training programs. Meanwhile, the results of this research could be compared to the practiced competences by experienced and successful environmental sustainability professionals in other regions or other European countries encountering similar bottlenecks. Comparative research might confirm or change the view on the resulting required competence cluster and its interactions.

Complex interaction of the competences and their dimensions within the cluster makes it difficult to evaluate the acquired competences. Evaluating them separately has less value, as it is the synergetic effect of the whole cluster which would make the difference. To close the gap between scientists and functionaries, a format should be developed for closer interaction of the Belgian Flanders functionaries with scientific knowledge and all possible solutions for environmental care.

Finally, the following questions can guide further research:

- Do these results, including added values and new insights, apply equally in the French regions of Belgium, in other European regions and other (environmental) sustainable behaviour change contexts? What is the impact of local habits and societal values on the results? Are these required competences also valid and sufficient for sustainability professionals working with a growing mix of nationalities and uprooted personalities within the target group, which can disenable the ownership feeling for local ecological environment? A comparative action research approach for example in Northern France could be interesting in the context of transboundary action projects.
- How can other environmental sustainability agents or functionaries acquire these required competences on short term, taking account of the urgency of action? Perez Salgado mentions the more productive informal learning on the job. Workshops have a positive effect by learning of experiences of others and mutual (peer) evaluation. Both experience in practicing the required competences and scientific knowledge, and good examples will be necessary also to form the target group of actual sustainability professionals.
- What are driving forces for sustainability professionals to choose to become a change agent for environmental sustainable behaviour? What is the importance of their experiences, entourage, school trajectory on their key competences fuelling a great responsibility, hunger for knowledge and critical choices?
- Do citizens showing self-steering behaviour change towards environmental sustainable behaviour all possess these key competences?
- How great is the risk in demotivating early adopters, up to affecting the altruistic personality, when an inadequate approach or polarisation is practiced, making them feel attacked getting the boomerang of their own action, by for example repressive actions and fines, or repression striking from lobbying groups, triggering the egoïstic values?

Answering these questions will contribute to knowledge production in sustainability science, whereby scientists and professionals cooperate together to enhance the change process towards sustainable behaviour within society.

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Attachments

At.1a List of selected participants for the workshop and effective participants (private)
At.1b Invitation for the workshop
At. 2 Results from literature review
At. 2 a and b Individual dimensions of competences from literature: hexagons
At. 3 a Raw data from workshop part 1 posters
At. 3 b Raw data from workshop part 2 plenary discussion (private document)
At. 4 Raw data of workshop in confrontation to literature
At. 4 a and b Hexagons confrontation literature to workshop
At. 4c Mutual confrontation of the groups to literature
At. 5 Clustering results workshop in confrontation to literature
At. 6 Interview manual (private document)
At. 7 Raw data interviews (private document)
At. 8 A Open, axial and selective coding of the interviews
At. 8 B Results interviews (public document)
At. 9 Results on main question: detailed interpretation of the required competences